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Isthmian Canal Salaries.

At a recent session of the United States Senate one of the members of that sedate body is reported to have said: "It is good old Anglo-Saxon stealing and not graft to pay such high salaries as are paid to canal officers." Therein lies the kernel of much of the ill-feeling displayed in Congress toward the Isthmian Canal Commission, unless signs fail. It is a natural criticism from one point of view. A country which pays its president a salary that would not tempt a fairly successful man to change a business he finds congenial, which pays its cabinet officers and federal judges but a small fraction of the sums they can earn in private life, is naturally not the country where the employes of any federal commission will be well paid without arousing criticism. Federal salaries are a most interesting study. The charwomen who are supposed to clean the executive buildings in Washington are probably the most overpaid employes, public and private, in the country. The messengers and minor clerks are paid more for less work than would be even discussed in a private business. A large part of the clerical assistants earn larger wages and work shorter hours than in any business office. But as the responsibility of the government office increases the rate of compensation, compared with that in private offices, falls, and falls very rapidly. The responsibilities, technical and financial, which are carried by Mr. F. H. Newell, chief engineer of the Reclamation Service, would not be assumed by an equally competent man, working for a private corporation, for much less than three times his compensation. In fact, all responsible places in the government service, administrative or technical, are underpaid. Our consuls are forced to makeshifts in order to keep up the dignity of the country abroad and our ambassadors are necessarily men of large means, as the government salaries are only large enough to rent the houses where these men must live. The financial strain put on our army and navy officers by service abroad is a great injustice to them, and is one of the most serious criticisms against our military policy.

There is, however, a reason for the low salaries that must be given considerable weight in some cases. Positions under the civil service are life positions, unless forfeited by incompetence or wrong-doing. Many men are so constituted that this fact is a weighty one with them, and it operates to decrease salaries, although this lowering should affect minor positions more than it does. There is also a certain measure of honor in serving the United States in a responsible position, which in itself has to be considered in fixing salaries, although such honor will not meet the bills of the grocer and butcher. These two considerations must inevitably tend to keep the salaries of the higher permanent employes somewhat lower than those of men carrying similar responsibilities in private life.

These reasons for low salaries do not apply to the work of the Isthmian Canal Commission, however, and the criticisms like that quoted do not take into account the really great difference between the canal service and the permanent staffs of the departments. The construction of the Panama Canal is a temporary undertaking. It is comparable in cost, difficulty and duration with the construction of the new water-works for the city of New York, save for the fact that at least 25 per cent. greater salaries must be paid to men living on the Isthmus to compensate them for the dangers and annoyances of tropical life, and a few of the higher officers should be the very best men in their respective callings, engaged at whatever salaries they name.

This last statement deserves a word of explanation. A private undertaking of the magnitude of the canal is supervised by officers who are closely in touch with it and are not exposed to outside criticism of an influential character. They are governed by none of the formalities and regulations which must be employed in government work. They can change and alter their requirements freely. Nothing of this sort is possible on the Panama Canal; it would be suicidal to the good name of the men and the work to permit it, because of the opportunities such a course would open for cries of graft and favoritism which are never heard on private work. The men at the head of each of the Commission's departments must, therefore, be exceptionally competent, for they must conduct their work with the celerity of private work of the same nature and nevertheless conform with all the safeguards and precedents that experience has shown to be essential in government administrative affairs. Moreover these men will get very little credit for their work, however good it may be, and are certain to receive constant criticism which they do not merit. They must give up lucrative positions in private life to accept public office of a temporary nature, and when their work is done they will not be in so good business standing as if they had discharged the same duties for business houses. To secure the right men for such positions the government must bid high, and if it can engage the right men for $10,000 or $15,000, it is lucky.

Heavy Railway Construction.

The construction of the new low-grade freight line of the Pennsylvania R. R. in southeastern Pennsylvania has involved some of the heaviest railroad work ever undertaken in this country. The tremendous volume of freight and passenger traffic tributary to the main line of the Pennsylvania R. R. has been handled for years with constantly increasing difficulty until now it is practically impossible to provide for additional movement on the tracks in service. The original main line west from Philadelphia was made up of a number of acquired lines, most of which contained heavy grades and sharp curves, and in many cases were built to avoid excessive cost of construction, and more to secure local traffic than directness of route. There has probably never been any rectification of alignment and betterment of way work that equal in magnitude the changes that have been made on the main line of the Pennsylvania R. R. in recent years. Notable among these changes are the Trenton cut-off, which shortens the length of haul, greatly reduces the ruling grades and diverts through freight traffic from the main line for a considerable distance in southeastern Pennsylvania; the extensive improvements that have been carried on in Philadelphia and vicinity, practically resulting in the removal of through freight traffic from the congested yards in that city; the Brilliant cut-off in Pittsburg, described in The Engineering Record on May 6, 1905, which provides a route for all through traffic that avoids the yard in the center of the business district of Pittsburg and the overtaxed three-track Allegheny River bridge, and the new portion of the main line between Lancaster and Harrisburg, Pa., through Mt. Joy.

These improvements have scarcely kept pace, however, with the increase in traffic and it became necessary to construct a line at the earliest possible moment to relieve the main line between Harrisburg and the western end of the Trenton cut-off, at Glen Loch, from the through freight traffic. The construction of this line was commenced with the building of a 5,500-car storage and classification yard at Enola, in the fall of 1903, said to be the largest yard in the world. Since the inception of work on that yard, construction has been carried on with exceeding rapidity, and although much of the work has been in rock, and has been excessively heavy, owing to the low established grades maintained through rough country, the low-grade freight cut-off will doubtless be completed and in operation by the coming summer.

The portion of this line for 28 miles east from Columbia has required some of the heaviest construction included in any of the main line improvements carried on to date. This work has necessarily been pushed at an exceedingly rapid rate. It is doubtful if as much contractors' plant was ever employed at one time in any piece of railroad construction of the same length in this country. The use of this large amount of plant is considered to be more than fully justified by the progress that was desired, and has been obtained. The work has not by any means, nevertheless, been prosecuted without regard to cost. Many interesting methods were employed in getting the plant placed in difficult positions, isolated from railroads and even from highways, where it was required. The manner of handling the construction has necessitated new methods. The large central compressed-air power plant for the operation of the standard rock and the derrick well drills, the use of the latter in making the deep holes for the heavy blasts and the manner of making fills, 90 to 150 ft. high and of considerable length, with material from rock cuts are perhaps the most interesting of these new methods. The variety of construction required on this portion of the new line has, however, required many other unusual details in the execution of the work.

The completion of the new low-grade freight cut-off does not fully relieve the main line of the through freight traffic, nor provide the low maximum grades established on that cut-off from Harrisburg to Philadelphia. A continuation of the cut-off from Glen Loch to the Fifty-second St. yard of the Pennsylvania R. R. in Philadelphia is generally understood to be under consideration. If this is built, it will furnish a connection which will provide a maximum eastbound grade of 0.3 per cent. and a maximum westbound grade of 0.6 per cent. between Harrisburg and Philadelphia. A separate two-track freight line, with the same ruling grades will be in service between Harrisburg and Jersey City when the low-grade freight cut-off is completed. Two additional tracks for freight service between Trenton and Jersey City are also understood to be under consideration, and when these and other improvements about to be undertaken are completed, it is believed that the present congestion on the main line will be entirely relieved.

The Fire Hazard in New York.

The National Board of Fire Underwriters has been conducting, through a special commission known as its Committee of Twenty, an investigation of the conditions regarding fire-resistance and fire fighting in the large cities of the country. Some of its reports have been issued, and a few have aroused strong protest, like that on the city of Buffalo. The report on the Boroughs of Manhattan and the Bronx in New York has just been published, and it presents a very unpleasant picture of the fire hazards in the country's leading city. The conditions are so bad in some respects that the public has long been cognizant of them in a general way, but the disquieting detail of the defects has not been appreciated. The arraignment of the existing conditions is made by representatives of fire insurance underwriters and consequently is doubtless not softened by any desire to understate the facts; on the other hand, every report of the Committee of Twenty has borne on its face the indications of an evident desire to be fair, and if the judgment of the authors of the reports is sometimes open to legitimate question, the investigation is one of the most important studies in municipal affairs ever made in the country. The reason for its importance will be pointed out after a brief review of the conditions found in New York.

The report deals first with the water supply. It states that the management as reflected in the maintenance of the distribution system has been decidedly inefficient, but recent innovations in organization and method show improvement. This is a statement with which Mr. Birdsall, Mr. Hill and Mr. de Varona will doubtless agree. It is only necessary to refer to their published reports for many years back to find practically the same statements, and the manner in which these gentlemen have discharged their onerous technical duties in the face of inadequate appropriations and political interference with subordinates has been distinctly efficient and praiseworthy. These facts are not stated in the report, but ought to be interpolated to show that the defective organization has long been a matter of protest by those who most directly suffered from it. The assertion that the present water supply is so deficient as to give rise to grave danger of a water famine in a dry year is merely a repetition of what has been said many times in the past, but it is not so generally known that the pressure in the water mains, particularly in the mercantile and manufacturing sections, are generally inadequate from the point of view of fire protection. It is important to distinguish between pressures which will furnish enough water for domestic and manufacturing purposes, and those ample to supply the great volumes suddenly required in the case of large fires. In the Borough of the Bronx a large proportion of the distributing mains are stated to be too small, but this condition is being remedied. Sufficient gate valves are provided for fairly good control, but inspection is generally so lax that they are liable to be in unworkable condition when needed. The hydrants are said to be generally well spaced, but of decidedly unsatisfactory types and poorly maintained. These statements concerning gates and hydrants, it should be added, are merely reiterations of the repeated reports of the engineering bureau of the water department.

Turning to the condition of the buildings, the Committee of Twenty makes some surprising assertions. In Manhattan the potential hazard is present in all built-up portions, varying from a low degree in the higher class residence, in the financial and in portions of the lower west-side tenement sections, to an unusually high degree in the entire southeast end of the island and in part of the wholesale drygoods district. It is due to the compactness of the city as a whole, the great heights, areas large of themselves or due to unprotected openings, narrow streets, large number of conflagration-breeding blocks with intervening conflagration-feeding blocks consisting of weak combustible units, and to the high winds. In the Bronx the potential hazard is mild, with a few exceptions. In Manhattan the probability hazard parallels the potential in most sections of the city, being high, as a rule, where the potential hazard is high and vice versa. The wholesale drygoods district is an exception, that portion mentioned as having a severe potential hazard really having a very low probability hazard, owing to the nature of the stocks, protection and cutoffs, and to the watchfulness and general care maintained. In the Bronx the probability hazard is light.

In a general way the conflagration hazard in Manhattan is summed up as having many serious aspects. Features ordinarily inconsequential are stated to have a special significance here. The very magnitude of the compactly built territory reduces the effectiveness of what would otherwise be fair fire breaks. Delancy St., the Bowery, Hudson St., the small parks and squares, and similar breaks, effective against bad local fires, would have little or no effect in such sweeping conflagrations as are possible in Manhattan. Except for Central Park, which would stop a conflagration that did not skirt it, the compact part of the city practically has no fire stops and is subject to conflagrations sweeping in any direction. Familiarity with this danger and confidence in a fire department of magnificent personnel, even if deficient in modern apparatus, have conspired to foster a sense of security which the committee states is unwarranted by the facts, which are that, from the standpoint of inherent hazard and damageable values, Manhattan presents a situation which should be alarming to the country at large.

It is unnecessary to go into all the details of the conditions on which the committee bases these general statements. They are given in extenso in the committee's report and their importance can be judged only after studying them carefully. That they reflect the opinion held by insurance underwriters for some years shows the importance of taking counsel with underwriters in matters affecting the fire-resistance of cities, and this brings up the fundamental lesson that this valuable report teaches. It is the essential lack of attention paid to the matter of fire protection by the city authorities, and the lack of co-operation between the departments in effecting fire protection. The subject is one that should enter into the rules and management of most of the city departments. The authorities ought to revise the building rules so as to make them conform with modern views of fire protection, which concerns many more things than the coverings on columns and the construction of elevator walls and firebreaks on roofs. The water department ought to have an organization that will enable it to co-operate instantly with the fire department in adjusting gates and otherwise feeding water into the mains where it will serve the engines fighting a great conflagration. The police department alone seems to be co-operating well with the fire department. The trouble lies in the difficulty in securing united action between several jealous municipal departments, none of which is willing to assume any responsibilty in any work over which it does not have exclusive control. Another feature of the present unsatisfactory condition is the lack of certainty of many of the requirements concerning building construction issued by the fire underwriters. This journal is in receipt of many complaints concerning the way in which requirements are altered during such short periods as are needed for the erection of a manufacturing building of good character. One architect recently stated that he had to change plans three times before the underwriters finally decided what they would accept, although his original plan and each of its successors was approved by the insurance people, and the changes were due to a shifting of their opinion before construction began. Such vacillations cause a lack of confidence in the justness of fire-protection requirements which is unfortunate.

The Voyage of the Carmania.

The maiden trip of the Carmania, the new turbine ship of the Cunard Steamship Co., was a very satisfactory one, so far as the passengers were concerned. What results were reached in operating costs and similar important matters will doubtless not be given out by the company for the present, but the delightfully smooth motion of the ship, even in heavy seas, and her complete freedom from the tremor produced by reciprocating engines, are advantages worth paying for by some increase in operating expenses, should the latter prove to be necessary. Ocean travel on a vessel of the Carmania's type is a luxury, and the history of transportation shows that there are always many people willing to pay well for the most comfortable quarters and highest speed when traveling. Consequently the success of the Carmania's trip must be looked upon as a very important event in engineering, for the turbine vessels hitherto put in service were by no means so large nor of such high speed as the new Cunard liner. The vessel encountered very rough weather, but it was necessary to drop down from full speed to three-quarter speed on only two days, probably a much shorter time than would have been necessary with reciprocating engines. No repairs of any sort were necessary, all parts worked smoothly and the engine room staff were outspoken in praise of the way the turbines operated.

The great importance of the trips of the Carmania is due to the fact that she is a sister ship to the Caronia in every respect save her turbines. Both were built at the Clydebank works of Messrs. John Brown & Co. and are 672½ ft. long over all, 72 ft. in beam, and have a moulded depth of 52 ft. Their gross registered tonnage is 19,524 tons. Each carries 300 first-class passengers, 326 second-class passengers, 1,000 third-class passengers, 1,000 steerage passengers and a ship's crew of 710 men, including officers. Their draft in working condition is 33¼ ft. They are among the dozen largest vessels afloat, and are unexcelled in point of speed. Consequently the installation of turbines on one of these twin ships and reciprocating engines on another will yield technical data of the very highest value. The boldness of this advance in marine turbine practice is indicated by the fact that the largest units previously made were of 78 tons weight, being the low-pressure turbines for the Virginian and Victorian, of the Allan line, while the low-pressure turbines of the Carmania weigh 340 tons each.

Another matter connected with this new vessel's equipment that deserves notice is the great expenditure made by the builders in designing her motive power. The Cunard directors originally proposed to fit her with reciprocating engines, but Messrs. Brown & Co. submitted an alternative bid for a vessel with turbines and recommended this change so strongly that their tender was accepted. The builders at once began to train their men in turbine construction. They obtained from Mr. Parsons drawings of a three-screw marine turbine outfit of 1,800 h.p. and put it under day-and-night construction. When it was completed it was erected on land, with all the accessories employed on board ship, and coupled to suitable electric generators. In this way a testing plant was obtained which permitted very accurate measurements of the operating conditions of such machinery. Not only the steam consumption under different ahead and astern conditions, but also such specially marine problems as the thrust of steam which, in actual ship service, would be balanced by the thrust of the steam, were investigated with great care. Careful studies were also made of the details of these powerful units, which have low-pressure drums 11 ft. in diameter and 8½ ft. long. Moreover, provision had to be made in the plans for overhauling the engines at sea, and the admirable way in which these problems were worked out has been the subject of warm approval by engineers who have visited the vessel. It may safely be asserted that repairs to turbines can be made much more readily than repairs to reciprocating engines on board ship, provided the facilities furnished in the Carmania are always provided.

The speed of the vessel on her voyage over is understood to have averaged in the neighborhood of 17 knots. The makers guaranteed a full speed of 19 knots, but on her trials she made 20.19 knots during the first six hours' run. On the measured mile at Skelmorlie she made from 19.94 to 20.57 knots, although her hull was then fouled by nine months of anchorage in the Clyde. In a general way the trials indicate that the Carmania is about a knot faster than the Caronia, and her first voyage shows that she is a better boat for rough weather than her sister ship with the reciprocating engines.

Notes and Comments.

The Mosaic Pavements in Hanover, which attracted the attention of engineers visiting that city, were originally introduced about ten years ago as a method of repairing old macadam streets. The surface was covered with small cubical stones, local limestone and sandstone, and the results were very satisfactory. The blocks now used are somewhat larger in size than those formerly employed, being 4 to 4½ in. deep and 3½ to 4 in. square. Other German cities are using these little blocks on streets where macadam wears rapidly.

Motor-Driven Grinders are used at the pulp mill of the Remington-Martin Paper Co., Massena, N. Y. In this mill a 1,000-h.-p. General Electric induction motor, supplied with 2,080-volt, 25-cycle, three-phase current, is used. It runs at 214 r.p.m., and drives four grinders on extensions of its shaft, two on each side, the connections being made in the same way that a turbine would be installed for the same service. The motor is started with an external resistance connected through collector rings to the rotor. Current is supplied by the St. Lawrence River Power Co. This installation has been so successful that the company is understood to have adopted it for another mill.

The Dry-Dock at Port Florence on the Victoria Nyanza, which was completed in September, affords an interesting example of the progress of civilization in the heart of the Dark Continent. There are doubtless many readers of this journal, resenting the imputation that they have reached middle age, who recall vividly the accounts of the early explorers of this region. Now the lake is navigated by a considerable fleet owned by the Uganda Ry., and this dock has been constructed for maintaining these boats. It is a small affair, cut in rock by natives who had never before done any serious work. It is 250 ft. long, 48 ft. wide and 14 ft. deep, and is probably the highest dry-dock in the world, being located at an elevation of 3,700 ft. above the sea level.

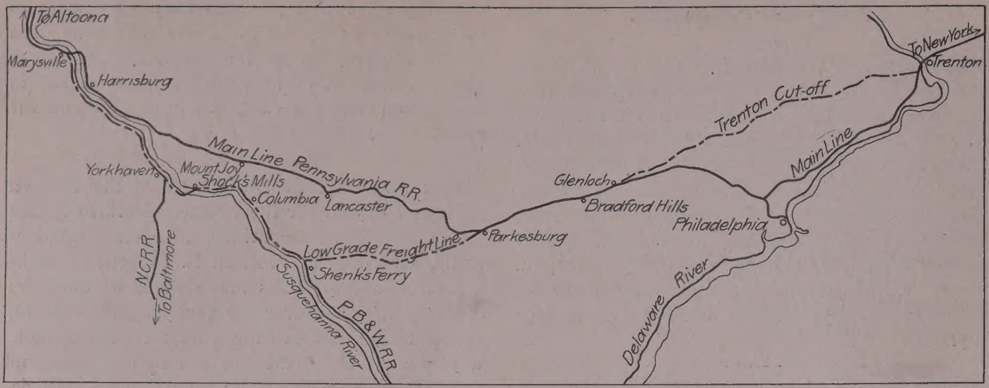
Reinforced Concrete Structures of novel design have been adopted for many purposes on the North Platte project of the Reclamation Service. For example, in the approaches from ditches to flumes, the walls of concrete 1 ft. thick are reinforced by horizontal 5/16-in. rods on 3-in. centers spaced 2 in. from each face. These walls are supported by buttresses 2 ft. thick at the top and 3 ft. at the bottom, in a typical case, and 7 ft. 9½ in. apart on centers. The wall is tied to each buttress by 5/16-in. steel rods. Some of the flumes are large structures. One of them, for example, has a central arch of 53 ft. 7 in. and side spans of 30 ft., with spandrel arches above them carrying a reinforced concrete flume 34 ft. wide and 12½ ft. deep. The culverts, syphons and other structures are also important pieces of work in many cases.

Payments to a Contractor on certification by an engineer have been before the Washington Supreme Court in a prolonged litigation, of which a few points were recently settled by a decision summarized in 82 Pac. Rep. 301 as follows: Under a contract for the construction of an irrigation ditch, providing that the decision of the engineer shall be final as to the meaning, intent and purport of the plans and specifications, the engineer has no power to vary the meaning of the plain terms used in the contract, and his estimate as to the work done and materials used is not conclusive evidence of such facts. Where a contract for the construction of an irrigation canal provided that payment should be made to the contractor only for the material actually used in the construction of the canal, the contractor was not entitled to be paid for material not in place, but merely strung along the line of the canal.

The Sewage Disposal Plant at the Eastern Indiana Hospital for the Insane, described in this journal on Oct. 28, continues to operate satisfactorily, according to Prof. R. L. Sackett, of Richmond, Ind., who states that schools of minnows come up the shallow creek receiving the effluent, almost to the outlet of the works. Analyses made a year after the plant was put in operation and recent microscopic examinations show a high degree of purification in the effluent. At present the crust on the septic tank is about 10 in. thick, and the deposit on the bottom does not amount to an inch, although the tank has not been cleaned in the two years since it was put in use. The filter beds are rested in rotation during the summer, each bed resting for a week at a time. The deposit on the surface is raked off about twice a year, and the material removed is non-putrescible; there is very little odor about the beds at any time.

The Cost of Coal Handling at the South Boston station of the Edison Electric Illuminating Co. was briefly mentioned in this journal on Nov. 18. Mr. Charles H. Parker has since furnished some additional information which shows that the average expense of 15.35 cents per ton includes the unloading from boats to bunkers, repairs, all handling and turning over in the storage field when the coal is hot, and the taking of coal from the storage field to the bunkers during the four winter months and over half of the time during the rest of the year. The greater part of the coal is handled twice, and some of it three times, before it is burned. The cost per ton unloading to the bunkers and field is 8.6 cents only. The large current expenditure was due in part to handling the coal so often, but to a much greater extent to working out some new apparatus which was in a partially experimental stage. The belts and reclaiming bridge are working at a very satisfactory current expenditure per ton of coal handled.

A Remarkable Repair to a cast-iron cylinder has recently been made for the Edison lighting and power station of the Public Service Corporation at Paterson, N. J., involving the "burning in" of a large section of flange which had been broken out from one end. The accident occurred on a 650-h.-p. Ball & Wood vertical compound engine operated at 150 r.p.m. to drive a jack shaft to which a number of series arc light machines are belted. The low-pressure piston rod broke below the piston and before the engine could be stopped the cover had been broken into many pieces and a section of the flange carrying the stud bolts, extending around fully one-third of the circumference of the upper rim of the cylinder, was broken out. At the suggestion of Mr. Wm. M. Brock, superintendent of the plant, a repair of the cylinder casting by the "burning in" process, was entrusted to a local foundry. It was entirely successful, the weld of the original casting being complete and distinguishable only upon close inspection by the difference in color of the metal. The repaired cylinder has been rebored with a very light cut to restore the casting to truth of outline; further than this the upper flange only needed refinishing and boring for bolt holes, before erecting. This low-pressure cylinder is 41 in. in diameter and of 24-in. stroke, with steam jacket cast integrally, so that the preparation of the mould and provisions for "heating-up" the fractured edge proved no easy problem.



Map of the Pennsylvania R. R. Low-Grade Freight Line Cut-Off.

THE LOW GRADE FREIGHT CUT-OFF OF THE PENNSYLVANIA R. R.—I.

Three years ago the Pennsylvania R. R. began to build a low-grade double-track freight line in Southeastern Pennsylvania which is now approaching completion and has involved some of the heaviest railroad construction ever undertaken in this country. The new line starts at Marysville and follows along the Susquehanna River for some distance; it then turns almost directly east and continues across the country to a junction with the old main line at Parkesburg and one with the double-track Trenton cut-off at Glen Loch. The latter was built several years ago to provide a more direct route to New York City for freight traffic and to eliminate the heavy grades on the main line. Since the construction of this cut-off extensive grade reduction and re-alignment improvements have been undertaken at various points on the main line to relieve the great congestion of traffic which has become very serious in the last few years. The low-grade line will be used for freight traffic only, and although it parallels the main and other lines of the Pennsylvania R. R. at various places its operation will be entirely distinct from the operation of those lines. It will have a ruling east-bound grade of 0.3 per cent., and a ruling west-bound grade of 0.6 per cent. between Harrisburg and Glen Loch, its present eastern terminus, as compared with 1.0 per cent. in both directions on the main line between these points. It will be ballasted with broken stone and laid with 100-lb. rails throughout. The construction of a low-grade, double-track line, 20 miles long, from Glen Loch to West Philadelphia, connecting the yards in the latter with the new line at the former, will doubtless be undertaken in the near future. When this latter work has been completed a double-track, low-grade freight line independent of passenger traffic, will be in service between Harrisburg and both New York City and Philadelphia.

The first work that was undertaken on the new line was the construction of a gravity yard at Enola, on the west side of the Susquehanna River just below the four-track stone arch bridge at Rockville, on which the main line tracks cross that stream. This yard has a capacity of 5,500 cars, and is built in connection with the Northern Central R. R., an acquired line of the Pennsylvania system. It is nearly 5 miles long, and has a total of 115 miles of single track. It contains separate receiving, classification, storage and repair yards for traffic bound in both directions. Ample roundhouses, coaling wharves and car and engine repair shops were also built in connection with it. The yard is built north and south along the bank of the river, and over 8,000,000 cu. yd. of excavation, much of which was in solid rock, had to be made to complete it.

The north end of the yard is connected by four tracks to the main line tracks just west of the Rockville bridge, which is 5 miles above Harrisburg. The Northern Central R. R. was four tracked from the south end of the yard for about 19 miles to Wago, a station just below York Haven, where that road leaves the river. A double-track line, 4.5 miles long known as the Codorus new line, was built along the river from Wago to a new double-track, stone arch bridge over the latter at Shock's Mills. At the east end of this bridge the line joins the canal branch. The two tracks of the new line parallel the tracks of the Columbia branch of the main line, which was the original main line prior to the construction of a line through Mt. Joy from Lancaster to Harrisburg, from this junction into Columbia, distance of about 7 miles.

All of this work required unusually heavy construction to secure the low grades established, as the country crossed by the line is largely very rough. The Enola yard was built first, a large amount of contractors' plant being employed in its construction, and during considerable of the time required to complete it work was carried on night and day. The four-track work on the Northern Central R. R. involve some particularly difficult work in widening the cuts and fills and in making re-alignment changes. The Codorus new line parallels the river quite closely in places and heavy work was necessary to bring practically all of it to grade. The building of the two tracks parallel to the Columbia branch included work about the same as that done on the similar construction along the Northern Central R. R.

An old single-track branch of the Philadelphia, Baltimore & Washington R. R., known as the Columbia & Port Deposit R. R., another acquired line of the Pennsylvania system, parallels the river on its east bank south from Columbia. The new low-grade line has been built practically parallel to this old line for a little more than 13 miles from Columbia to Shenk's Ferry, where the former turns east and continues across the country. The track of the old line in this distance was only 15 to 25 ft. above the normal stage of the river and considerable portions of it were periodically thrown out of service by ice and high water. The river is over a mile wide at Columbia and falls about 5 ft. to the mile, the railroad grade closely following the fall in the river. The first 4.5 miles of the east river bank south of Columbia is practically level, and mostly above high water. In this distance the old line is being rebuilt at practically its old grade. The two tracks of the new line start to rise on a 0.3 per cent. grade a mile below Columbia and continue to rise almost uniformly at that rate for 28 miles, in order to get sufficient height to be able to cut across the country after leaving the river at Shenk's Ferry. This 28 miles, which is now under construction, includes the heaviest work in the whole distance between Harisburg and the eastern end of the low-grade line.

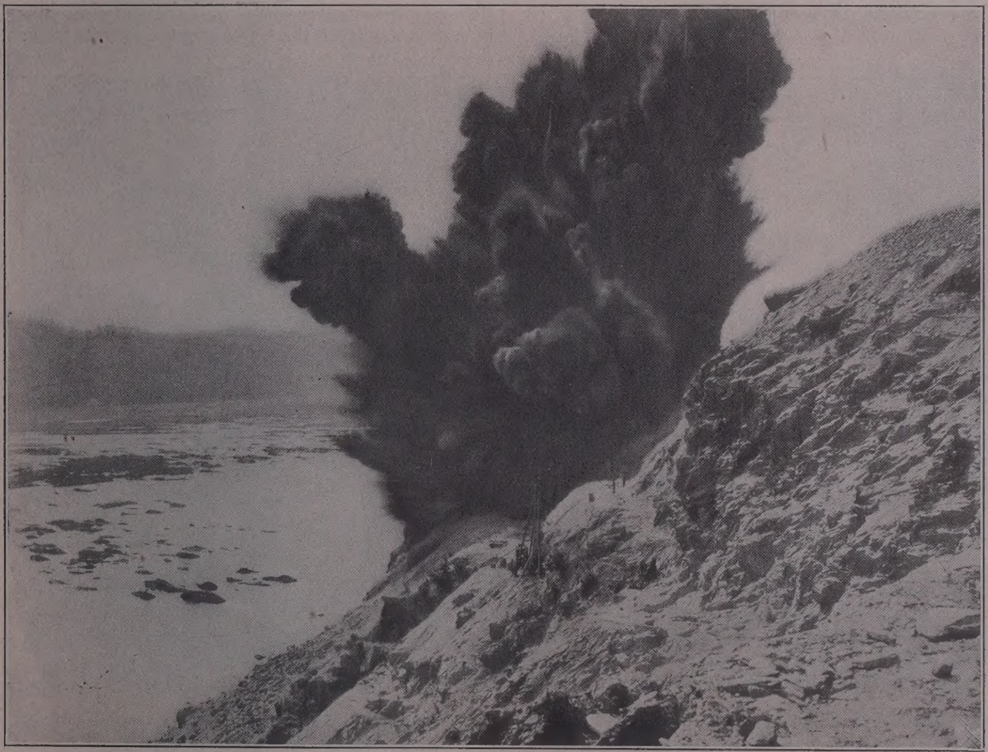
The old line was close to the river just south of Columbia, but a heavily traveled turnpike crossed it and after continuing parallel to it and between it and the river for some distance, crossed to the inside again. Nearly 4 miles of this turnpike have been rebuilt and all of it is now on the land side of the tracks. This change in the highway also required the relocation of much of the old line. The tracks of the new line in this same distance are between the track of the old line and the river, on a fill which increases from almost nothing until it is about 50 ft. high. This fill was made from a pole trestle with material from cuts farther south, much of which was hauled more than 4 miles. The only available place along the line where material could be borrowed was in a solid rock ledge closely paralleling the tracks on the land side. A 70-ton Marion steam shovel has been installed in a pit blasted in this ledge, and what material can be taken out is utilized in making the fill.

At the end of this long fill the Columbia & Port Deposit track crosses under the new line and continues on the river side of the latter in the remainder of the distance where they are parallel. The difference in elevation at this crossing is 23 ft. Beyond the crossing the old line approximately follows the descending grade of the river, while the new line is rising, so that the difference in elevation between them continually increases until it reaches more than 150 ft. before the new line leaves the river at Shenk's ferry. The river bank begins to rise precipitously from the undergrade crossing, and for 8 miles is practically all sheer rock ledges, 175 to 480 ft. above the river. The tracks of the new line are being built on a bench blasted out of the rock, 50 to 150 ft. above the water, the estimated average excavation required to place them there being approximately 1,000,000 cu. yd. per mile for about 7 miles. The old track of the Columbia & Port Deposit R. R. was built on a narrow bench around the base of these cliffs, many of which overhung the river. It was just above ordinary high water and was completely covered with water and ice by unusual floods. It will be relocated considerably above its old grade and above everything but an extraordinary flood, on a bench built in the outer slope of the bench cut through for the new line.

The contract for building the portion of the new line between Columbia and a point about 3 miles beyond Shenk's Ferry was awarded to Mr. H. S. Kerbaugh, Inc., of Philadelphia, about the middle of November, 1904, and it was agreed to have the line in operation by March, 1906. The carrying on of this construction under ordinary time conditions would have entailed exceptionally difficult work, but the extremely short time available under the agreement has required the installation and operation of a vast amount of contractor's plant under the most unfavorable conditions. Twenty-four steam shovels, upwards of 150 narrow-gauge locomotives, with sufficient number of dump cars for their proper operation, 48 self-propelled traction engine well drills and about 250 standard rock drills have been at work continually, much of the time night and day, almost since the inception of construction a year ago. A central compressed-air power plant, with a capacity 9,784 cu. ft. per minute delivered at 95 lb. pressure—the largest plant of this type ever used on contract work—was installed at Safe Harbor near the lower end of the side hill work, under the direction of the Philadelphia office of the Ingersoll-Sergeant Drill Co., of New York.

An air line extends along the work up and down the river from this plant, and supplies power for the operation of the rock and well drills, the maximum distance of direct transmission being 5.4 miles. A complete description of this plant was printed in The Engineering Record, October 28, 1905. Dynamite is used in springing all the well drill holes and black powder is employed in loading them. Many of the blasts have loosened more than 100,000 cu. yd. of material.

The difficulties attendant on placing the large amount of contractor's plant that is at work were exceptionally great. With a few exceptions the rock ledges rose so abruptly from the track of the Columbia & Port Deposit R. R. that steam shovels brought in over the latter could not be raised to the grade of the new line. Even if they could have been, there were few places large enough for them to stand and work. For some distance back of the rocky cliffs which form the river bank the country is very rough. Practically all of the few roads that have been opened up have natural surfaces, with long, heavy grades and sharp curves. In the immediate vicinity of the river there were no roads open and narrow private roads laid on the natural contours of the country afforded the only access to the top of the high, steep bank of the river in which the bench for the new line had to cut. Moreover, much of the plant had to be placed in the winter of 1904-5, which was exceptionally severe in this locality.



A Blast Which Dislodged 150,000 cu. yd. of Solid Rock.

An open-bench, earth cut, about a half mile long, marks the beginning of the side-hill work at the end of the long fill south of Columbia. A 70-ton Marion steam shovel, run in from the track of the old line, was placed in this cut and most of the material removed by the shovel was hauled out and dumped from the pole trestle in the long fill. Beyond this earth cut the bench cut in the rock begins and continues almost uninterruptedly to the end. About 1¼ miles from the beginning of the earth cut a narrow valley, with its bottom 35 ft. above the old line, crossed the new line. An incline was built up from the former about to the grade of the latter, and a 70-ton Marion steam shovel was hauled up this incline from the old line and started at work. A path wide enough to carry a track for the shovel was blasted out along the side hill and the material cast over the bank. When the shovel had worked its way through, it turned and worked back, a narrow-gauge track being laid on the bench that had been cut through, in order to facilitate the removal of the excavated material. Several heavy blasts had to be made to loosen the material so it could be handled by the shovel, which continued to work back and forth until the bench was brought to grade the proper width.

A short distance south of the point where this shovel started at work a solid rock ledge, with a vertical face rising 250 ft. above the water, formed the river bank. This ledge was about 400 ft. long, with sheer faces at both ends, and contained in this length more than 150,000 cu. yd., which had to be removed to bring the tracks to grade. Practically all of this material was loosened in one blast.

The rocky points on the top of the ledge were first drilled with standard rock drills and blown off, a lift of about 30 ft. being removed in this manner. Seven derrick well drills were then brought in from the railroad over the inland country roads and then over new roads built out to the work. These new roads in many places were on benches on the abrupt side hills and contained short lengths of grades as steep as 20 per cent. and many sharp curves. As rapidly as the well drills were in position they were started at work and made thirty-eight 6-in. holes, averaging 118 ft. deep, and extending 10 ft. below grade. These holes were sprung with dynamite, 21 tons of which were required to make room in the bottom of them for the black powder charge. None of the holes were lost in springing. Much assistance in determining the effect of the small shots was afforded by the possibility of lowering incandescent electric lamps into the 6-in. holes. After the holes were properly opened below grade they were thoroughly cooled by extending pipes from the air line down into them and then allowing the air to flow. When sufficiently cooled they were loaded with black powder, over 100 tons of explosives, exclusive of the dynamite used in springing, being placed in the holes. To insure the simultaneous explosion of all of the blast 6 to 8 exploders were used in each hole and the blast set off with electric current from a temporary power plant about a mile distant. This plant contains a 48-kw. Westinghouse generator, belted to a vertical automatic Westinghouse engine and furnishes power for lighting the work in the vicinity at night and for firing the larger blasts. A duplicate of this plant is installed at Safe Harbor, several miles farther down.

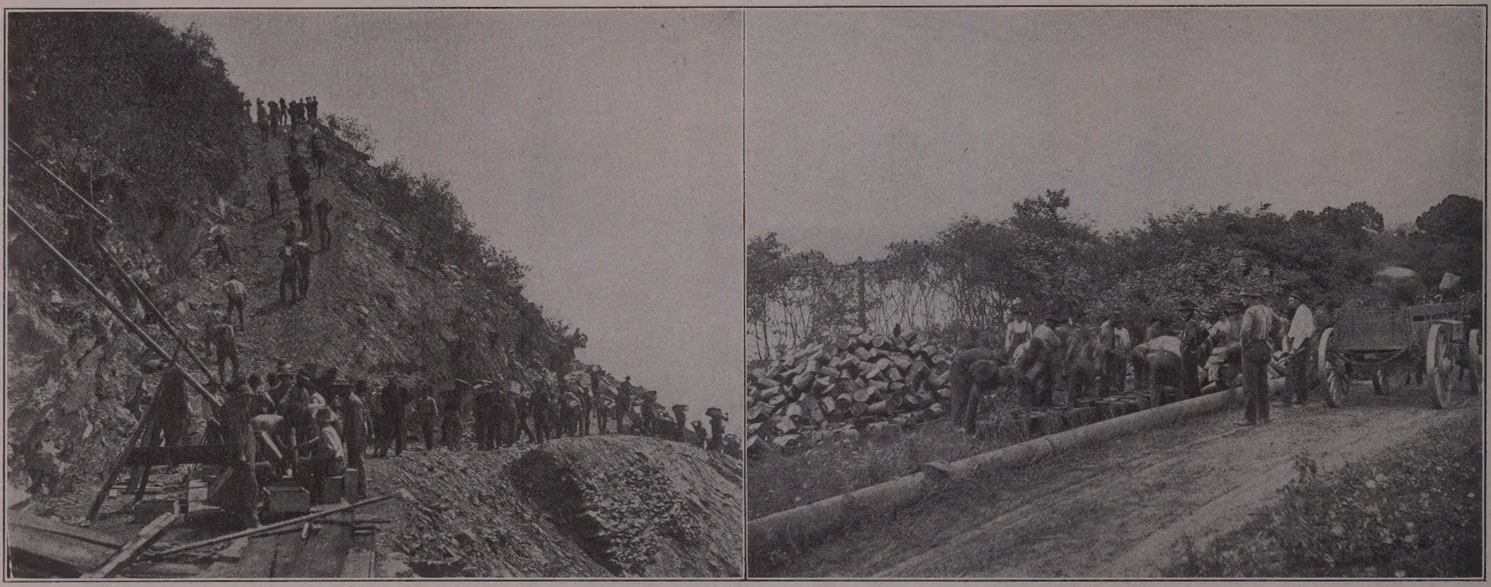
The results of this blast were satisfactory in every way. The portion of the ledge inside the slopes of the new line was so thoroughly broken up that most of the material could be removed by a steam shovel. Stone containing 30 to 60 cu. yd. were thrown 500 to 600 ft. One boulder estimated to contain 3,500 cu. yd. was thrown 300 ft. from the position it occupied on the face of the cliff. The quantity of explosives employed may have been in excess of what would have been required to simply loosen the rock so it could be broken up in small blasts and handled by a steam shovel. The results desired, however, were entirely different from the usual requirements. A large percentage of the rock had to be wasted, as there were no fills of any consequence in the vicinity. What material could be utilized was only that necessary to level off the bench and to finish out the slopes on the river side. Sufficient ammunition was therefore placed to push outward the whole mass of rock outside of the inner line of the bench carrying the tracks, as well as to loosen the rock so it could be handled by shovels. The conditions existing at this blast and the results desired were very similar to those that have been encountered at many other places on the line, and what may have been an excess of powder under ordinary circumstances has been frequently employed.

A narrow gorge separated the ledge disturbed by this shot from a similar ledge containing approximately 100,000 cu. yd. This ledge was also removed by a single blast, which was placed much the same as the one in the larger ledge.

A succession of high, narrow ledges extended into the river in the next half mile beyond the two points in which the heavy blasts were fired. These ledges were removed with much difficulty, owing to their inaccessibility and to the steepness of their faces. Top lifts were generally removed from them with rock drill blasts. Well drills were then hauled in over roads cut along the side of the ledges, and lowered to position with triple blocks and steel cables. In some cases where roads could not be constructed the well drills were mounted on trestles built out over the sides of the rock. The materials loosened by the blasts were largely handled by steam shovels.

Beyond these abrupt points of rock a short valley 750 ft. wide at the grade line of the new tracks, 75 ft. above the water, extended down to within a few feet of the Columbia & Port Deposit track. Before enough blasting had been done to cover the latter, two 70-ton Marion steam shovels and a sufficient number of small engines and dump cars to serve them, were brought up on that track and placed in the valley. Inclines were built in the steep sides of the latter and this plant all hauled up on them to the grade of the new tracks. When the material had been loosened by blasting the shovels were put in operation, one working in each direction. The methods followed in working the shovels were much the same as those previously described. In some cases, however, enough of the rock would be loosened so a narrow-gauge track could be leveled off by hand, then the shovel would come through working against a face and discharging into dump cars on the narrow-gauge track.

Two tall crags known as the Buzzard from the manner in which their tops projected out over the river, rose almost perpendicularly from the valley in which the two steam shovels were stored temporarily. The top of these crags at the upper end of the slopes of the cuts through them was 220 ft. above the grade of the line. Three 30-ft. lifts were first taken off the top with blasts placed in rock drill holes. Roads were then built in for well drills and 6-in. holes, 130 to 140 ft. deep, sunk by the latter. The whole rock was then disturbed in one blast. In the next 6,000 ft. a cliff rising 150 to 275 ft. above the river, has been loosened in blasts of 50,000 to 100,000 cu. yd. at a time. At one point half a mile beyond the Buzzard 100,000 cu. yd. had to be taken out of a single crag, 600 ft. wide, along the center line of the tracks.


Line of Men Carrying Powder from Bottom of Pipe Lines for Big Blast; Dumping Powder into Boxes at Top of Pipe Lines.

A 20-ton Marion steam shovel was brought down a valley extending some distance inland along one side of this point. This shovel was hauled 7 miles on its own trucks over country roads, without laying a track. Its trucks were lashed so they could not turn and two 35-h.-p. traction engines were hitched to it. Steam was also kept up in its boilers, and its traction gearing kept in service. Many of the grades on the roads exceeded 15 per cent., but the shovel was hauled the 7 miles between 7 o'clock in the morning and midnight. It was lowered to the grade of the new line with blocks rove with wire cables, a descent of 250 ft. being made in a quarter of a mile.

A 70-ton Marion steam shovel was brought up to the grade of the new line from the old line at about the same point the small shovel was lowered to the latter. A switchback was built up the valley on grades of 25 to 37 per cent. and the shovel hauled up these with triple blocks and steel cables. Four engines and 40 dump cars for these shovels were hauled inland over the roads and let down the valley. Other engines and cars were brought up the switchback.

The excavation in the next mile beyond this valley is exceedingly heavy, the rock rising 150 to 225 ft. above the grade of the new tracks, which are 130 ft. above the river. The top of the ledge was first removed in the usual manner with small blasts in rock drill holes. Switchback roads were then blasted out on the face of the ledge and well drills brought in over them. Drilling was commenced July 1, last. Eight well drills worked day and night and 16 rock drills worked during the day, all being driven by compressed air from the pipe line. Eighty 6-in. well drill holes with an average depth of 115 ft. were sunk through the body of the rock; 125 rock drill holes, none less than 30 ft. deep, were placed around the base and projections of the ledge. Drilling was finished August 1, and the holes were all sprung by August 19, the latter work requiring 21 tons of dynamite and 1,000 exploders. The holes were allowed to cool for two days while preparations were being made for loading the blast. The loading was commenced at 7 o'clock on the morning of August 21, and completed at 5 o'clock the next morning, 200 laborers being employed without intermission, except to eat, and they ate in relays. The wiring was finished and the shot was fired at 5 o'clock that evening, 34 hours after the loading commenced. In order to insure the results desired of the blast, 31 tons of dynamite, 6.5 tons of Judson powder, and 161 tons of black powder were used in loading the holes.

The rapid loading of so many holes and the handling of such large quantities of explosives was made possible by the careful preparations for supplying the men at each hole with explosives as fast as they could use it and in shape to be placed in the hole. The top of the hill was 135 to 140 ft. above the bench or the top of the blast, and a very steep, zig-zag path cut in the slope was the only approach to the latter. The well drills had been lowered down and hoisted up this path with triple blocks and steel cables. The path was too steep for men to descend safely with a box of dynamite, so the men were placed in a row extending down the path and boxes of dynamite passed from man to man. Two hundred and fifty 50-lb. boxes were handled in 20 minutes in this manner. The black powder was hauled up an interior road to the top of the slope in wagons by four-mule teams. It was emptied from the tin kegs in which it was delivered into a 3x4x8-ft. open box at the top of the slope. Two 3-in. pipes were extended down from the latter to a shelf cut in the ledge above the blast. The powder was trapped at the end of the pipes and emptied into 50-lb. boxes as desired, the boxes being carried to the holes as needed. Not a man was injured at any time on the blast. The section of the hill disturbed by this blast was about 700 ft. long with an average depth of 80 ft. and an average width of 100 ft. Much of this material was removed by the steam shovels. A narrow valley separated this projecting ledge from a series of similar ledges extending for 2,500 ft. along the line to the valley of Conestoga Creek. This material was loosened in blasts which disturbed from 50,000 to 100,000 cu. yd.

(To be continued.)

Government Contracts; Legal Pitfalls and How to Avoid Them.—I.

By George A. King and William B. King, Members of the Bar of the Court of Claims.

Making the Contract.—"The court is aware that citizens of the United States transact their business generally under State laws, and are not familiar with acts of Congress, and might well rely in such matters upon the knowledge and good faith of the officers of the Government. But these facts can not validate that which is declared by statute to be invalid. Ignorance of law does not change the law."

This language of Chief Justice Nott of the Court of Claims in a recent case, sets forth very plainly the dangers of contractors in the transaction of business with the United States. Their corresponding duty and responsibility were stated by Justice Miller of the Supreme Court forty years ago:

"Our statute books are filled with acts authorizing the making of contracts with the Government through its various officers and departments, but, in every instance, the person entering into such a contract must look to the statute under which it is made, and see for himself that his contract comes within the terms of the law."

From the beginning to the end of its contracts, special rules of law guard and protect the interests of the United States and in so doing add to the contractor's responsibilities and limit his rights. A contractor must at all times, in determining his course of action, consider not only the general rules of law which govern private individuals, but also the provisions of Federal statutes protecting the interests of the United States under contracts and the special doctrines which the Court of Claims and the Supreme Court of the United States have applied to contracts with the United States.

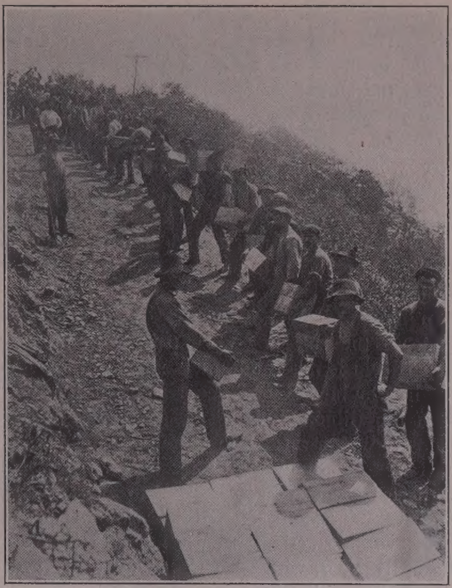
At the very outset, two important statutes meet contractors. Section 3709 of the Revised Statutes provides that all contracts for services or supplies for the departments must be made after advertising for proposals, except in emergencies, and Section 3744 requires that every contract made by the Secretaries of War, of the Navy and of the Interior or their subordinates shall be reduced to writing and signed by the contracting parties.

Advertisement.—It will be noticed first of all that the former of these statutes is general in its application to all contracts with the United

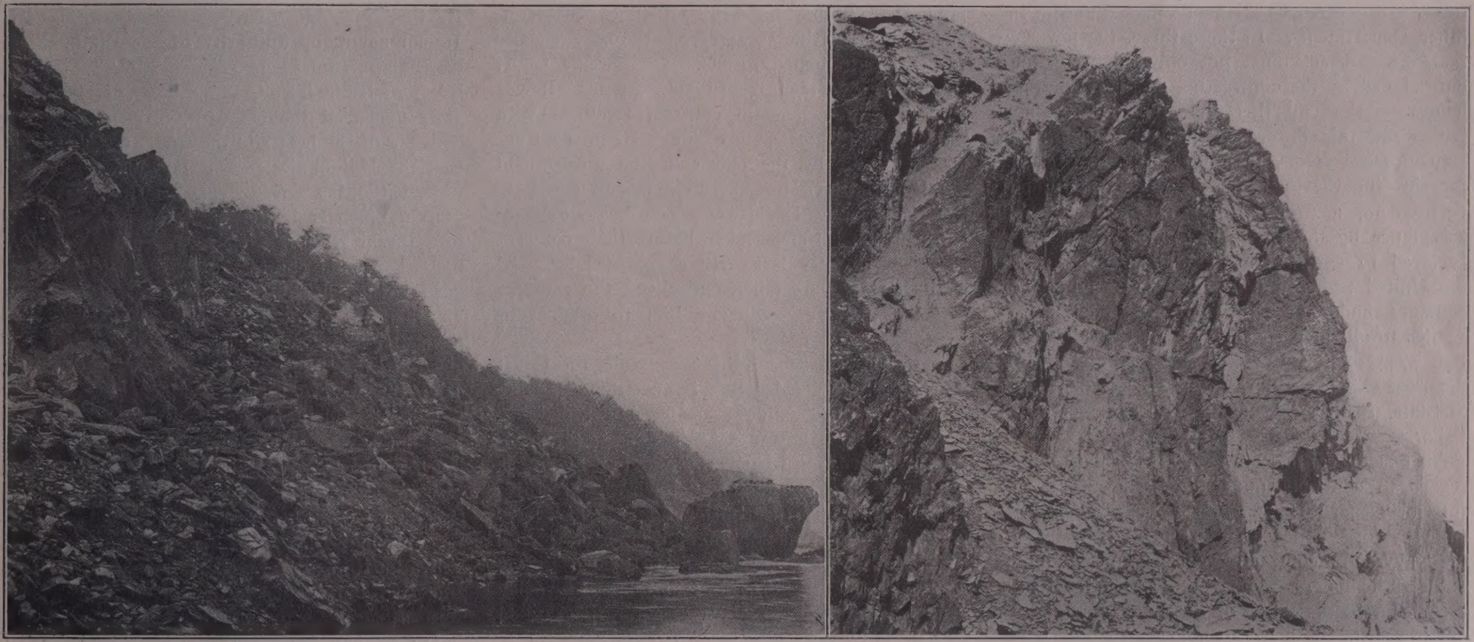
States; the latter applies only to contracts in the War, Navy and Interior Departments.

Exactly what is an emergency which will authorize contracts to be made without advertising has never been decided by any court. The Supreme Court, in a celebrated case involving very large purchases for the Commissary Department of the Army, said that this statute "invests the officer charged with the duty of procuring supplies or services with a discretion to dispense with advertising, if the exigencies of the public service require immediate delivery or performance." Having that discretion granted him by law the court goes on to say that "the validity of the contract cannot be made to depend on the degree of wisdom or skill which may have accompanied its exercise."

From this it seems plain if an officer declares that an emergency exists requiring that advertising be omitted, the contractor need feel himself under no responsibility in regard to due advertisement. On the other hand, the contractor must be sure that such a declaration has been distinctly made by the officer making the contract, or it will be incumbent on the contractor to show affirmatively that an emergency existed in order to sustain his contract as valid, if not advertised.



Line of Men Passing Dynamite.



The Same Ledge Before and After a Big Blast on the Pennsylvania R. R. Low-Grade Cut-Off Construction.

Shortly after this decision the Court of Claims had another emergency case before it. An officer of the Navy Department declared that an emergency existed requiring the immediate purchase of certain boiler felts. These were bought in Boston in two lots, one for immediate use and the other for use after some delay. Boston was not a market for these felts and the price at which they were sold in Boston was twice the price for which they could have been purchased in New York. The court declared that the officer's decision, that an emergency existed, was conclusive upon the government and sustained the contract at the full contract price for the first lot purchased for immediate use. As to the second lot, the court quoted the statute allowing emergency purchases to be made "at the place and in the manner in which such articles are usually bought and sold between individuals." It said that there was time enough to permit inquiry into the usual place of purchase and the usual price and that, since this purchase had not been made in the usual market, the law had not been complied with. They sustained the purchase as valid but allowed only the market price instead of the higher price agreed on.

This decision sustains the power of the officers of the government to bind the United States by declaring an emergency, and purchasing without advertisement, but places a limitation upon extravagance in such purchases.

On the other hand, in a very recent case the Court of Claims has declared that if an exigency clearly existed, a contract is good without advertisement even without a formal declaration of the emergency. An appropriation was made to relieve the suffering condition of the people of Alaska and emergency purchases were made for this purpose. The court held that this upon its face showed the existence of a particular exigency which excused all advertising and other formalities and enabled binding contracts to be made without complying with the literal requirements of this or any other statute.

The exigency which authorizes advertising to be dispensed with does not necessarily dispense with putting the contract in writing under the other provision of the law. In a case arising in the Civil War, it was decided that the contract not being in writing, was invalid, although plainly an emergency contract. The court said that the very fact that the contract was "made in an emergency, without the usual safeguards and supervision," rendered it more than ever necessary that it should be in writing.

There has been some discussion in the courts of the question whether the requirement of advertising is merely a direction to the officers of the United States or whether it is a condition to the validity of contracts made by them. Stated in another way, the question is whether a legal and binding contract is made if there is no advertisement. This question was raised in some early cases in the Court of Claims, but not decided, but one of the Attorneys-General in 1862 decided that contracts made without advertising and fairly entered into by the parties are binding upon the United States, not only as to work already done but as to the remainder of the work under the contract. This would leave the statute requiring advertisement simply as advisory to the officers of the government. The doctrine declared by the Court of Claims in the case of the naval purchases just referred to, seems to be contrary to this view in holding that a contract made without advertising, if its circumstances preclude the existence of an emergency, does not bind the government at all as to price, even if the contract is wholly executed. A later Attorney-General, in 1876, distinctly overruled the opinion of his predecessor, in 1862, and held that a contract without advertisement, not in an emergency, was wholly void. We must conclude that this question is not yet positively settled. Still it is clear that contractors must proceed with caution in regard to all contracts made without advertising and be sure either that an emergency has been declared or, in the absence of a declaration, actually exists. Otherwise the contract, if any question ever arises about it, may be declared void. In a recent opinion of the Court of Claims a distinguished judge said:

"The agents or officers representing the defendants were not general agents with complete and unlimited power to bind their principal, but special agents circumscribed in their action by the terms of a written law."

This is a very striking expression of a general principle which governs the Court of Claims and the Supreme Court of the United States in relation to all contracts. It confirms the late opinion of the Attorney-General that a contract, made without advertisement and not in an emergency, is itself void and may be so treated by either the United States or the contractors. If this be so, the responsibility is upon the contractors to make sure that the proposed contract has been "advertised a sufficient time." If controversy arises, the supposed contract may be held by the courts to be wholly void and to confer no rights whatever. To this rule there is one apparent exception, to be more fully discussed later on, namely, in a case where the contract has been completely executed.

Written and Verbal Contracts.—This brings us to the statutory requirements that contracts shall be in writing and signed by both parties at the end. While this relates only to the War, Navy and Interior Departments, yet it was held by the Supreme Court that a verbal contract was invalid when made by a subordinate officer of the Treasury Department, if he were authorized by the department regulations to make contracts only in writing. The party with whom he contracted without writing gained no rights whatever as against the United States. Contractors must beware at all times of verbal contracts, orders or modifications of contracts. They are a frequent pitfall to the unwary. Everything in relation to government contracts should be in writing.

There is one difference between written contracts in the three Departments named and in the other Departments. In these three, the law says that the contract must not only be in writing, but "signed by the contracting parties with their names at the end thereof." The courts have recognized this difference in their decisions in actual cases. Thus, in a very well-known case for carrying the mails on the Pacific Coast, advertisement, a proposal by the contractor and acceptance by the Post Office Department were declared to constitute a binding contract with the United States and a suit was sustained for damages under such a contract. That ruling applies to all the Departments not named in section 3744 of the Revised Statutes, these being the Post Office Department and the Departments of State, Justice, Agriculture, and Commerce and Labor.

An exactly contrary rule has been declared in regard to contracts under the War, Navy and Interior Departments. A definite agreement was made by correspondence between the Secretary of the Navy and a contracting corporation, for building certain boilers. The letters passing between them showed the terms of the contract precisely, but it was not reduced to an agreement "signed by both contracting parties with their names at the end thereof." Shortly afterward the Secretary of the Navy notified the contractor to "discontinue all work by you contracted for with this Department." The company sued for damages for breach of contract, but the Supreme Court said that there was no contract "in the form required by law" and that consequently "the United States never became bound." We shall see later on that a different rule would have been applied had this contract been completed and the boilers delivered. There have been a number of cases in the courts illustrating how stringently this statute has been enforced. In one case, a contract for board and instruction of Indian children was made out in the name of "John S. Lewis, Treasurer of the Cathedral Chapter of Southern Dakota," the chapter being a corporation. A change in the treasurership occurred and notice was sent to the Department at Washington. The Treasury Department paid the old treasurer, in spite of this notice. He kept the money, failed to account for it to the Chapter, and the Chapter sued in its own name in the Court of Claims, for the sums paid to John S. Lewis, as treasurer, after the notice of his retirement had been received. The court decided that the contract was with John S. Lewis personally and that the Cathedral Chapter had no rights in the contract. This was based upon the principle that the written contract alone governed and that the party whose name appeared in writing both in the body of the contract and at its end was the party to whom the United States must look as contractor, even if words were added describing him as an officer of a corporation. This case indicates the care which must be taken when contracts are made by corporations or by partnerships. In the one case the corporation must appear itself as the party contracting and in the other the members of the firm must all be named individually.

In another case a very strict application was made of the rule that a contract with the War Department is not valid unless signed in the form required by law. Certain contractors bid on work upon the Illinois and Mississippi canal, and the contract was awarded to them. A formal contract was signed by the contractors and the local engineer officer and forwarded to the Chief of Engineers for approval. Anticipating his prompt and favorable action, usually a matter of form, the contractors, with wise forethought, proceeded vigorously with elaborate preparations for the execution of their contract. The Chief of Engineers refused his approval, and when the claimants sued both for their actual expenses incurred in preparing to carry out the contract and for their anticipated profits, the Supreme Court refused to give them even their expenses. It was held that they had no contract relations with the United States before the written contract was approved by the officer of the government finally authorized to pass upon it. In this case these contractors learned at a very heavy expense to them that all steps taken before their contract received the very last written approval required by its terms, were taken entirely at the contractors' risk,—a very valuable hint to other contractors.

As a consequence of this same rule, the Court of Claims has decided that if an extended delay occurs after the contract has been awarded before the formal contract is signed, the contractors have no remedy at all for any losses caused to them by the delay. Such a case as this actually arose in the construction of the Naval Observatory at Washington, and damages for the losses caused by this delay were denied to the contractor on the ground that when the delay occurred, he had no contract with the United States.

Many other cases could be cited of the strict application of this rule in relation to written contracts and the absolute need of seeing that the law is absolutely complied with exactly in accordance with its terms. It is true that only the War, Navy and Interior Departments are governed by this statute but these, aside from the Post Office Department, embrace probably two-thirds of all the government contracts of a character likely to involve litigation. The War Department has charge of all river and harbor contracts and of the Panama Canal as well as contracts for strictly military construction, material and supplies. The contracts of the Navy Department include war vessels, docks, buildings, material and supplies. The Interior Department has not only the great business of Indian Affairs but has just begun in the irrigation work a series of the largest contracts ever let by this government.

Executed Contracts.—There is one important exception to the rule that a written and signed contract is necessary in these three Departments to sustain a legal claim for payment for service done or goods delivered to the United States. It can best be illustrated by some decided cases.

A contractor with the War Department in Texas, many years ago furnished a steamboat to the government and the government used the boat and lost her. There was no signed contract, but it was verbally agreed that the government should pay a rental for her use and her value, if lost while in the United States service. The owner sued to recover both for the use of vessel while the government had her in service, and the value of the lost vessel. The Supreme Court decided that the owner could recover payment for the use of the vessel on proof of her rental value. This was placed upon the general principle that when the government secures the benefit of services or supplies upon a promise to pay for them, it is bound to pay the value of the services or supplies, whether the promise be express or implied, verbal or written. Even here the Supreme Court made a very important discrimination. Although the oral contract had provided payment for the vessel if lost while in the government's service, the Supreme Court held that it was still under no obligation to pay for the loss, since the contract to do so was void from the beginning. The obligation to pay was based on the use of the vessel and not on the verbal contract.

The same principle has been repeatedly applied by the Court of Claims in other cases, where goods were delivered without a written contract. An instance of this occurred where a local Indian agent, by authority of the Commissioner of Indian Affairs, contracted orally for the delivery of beef. The Commissioner of Indian Affairs approved the claimant's voucher after the delivery of the beef and the Court of Claims held that the United States was bound to pay for it, even without a written contract.

In a much earlier case, the claimant had sold to the War Department a lot of railroad ties, but had no written contract or memorandum in regard to the sale. The Court of Claims awarded him their value, notwithstanding this defect. They then stated the very distinction afterward recognized by the Supreme Court in the later case, using these words:

"The defendants rely upon the fact that there was not a written contract in the case authorizing a recovery. We distinguish between a right of recovery upon executory contracts where damages are sought for non-performance by the defendant, and those that arise from an implied obligation to pay for articles actually purchased and used and applied by the defendant."

In a similar case the government was held bound to pay for a lot of horses sold and accepted under a verbal contract, the court saying that the government was liable when the property was once delivered, even if it might not have been charged with any responsibility for damages had the contract not been carried into execution.

This narrow exception to the general principle governing contracts with the War, Navy and Interior Departments, emphasizes the importance of having all contracts reduced to writing and signed with all the formality required by law.

Practical Rules.—Summarizing the subject of entering into contracts with the United States, the following rules may be laid down for the guidance of contractors who wish to be sure that the contracts which they make will be held valid, should disputes subsequently arise in regard to their rights or the obligations of the United States under them:

1. In all dealings with the United States, there should be a written contract, signed by the parties at the end thereof.

2. The contractor should ascertain definitely whether the contract proposed has been duly advertised.

3. If there has been no advertisement, the contractor should then ascertain (1) whether an emergency has been declared by the officer letting the contract, or (2) whether an emergency actually exists.

4. The contracting party must be correctly named in the written contract.

5. Work or delivery of material or supplies should not be begun until the contract has been finally approved by the last officer whose approval is required by the law or regulations.

6. In entering into a contract, the responsibility is on the contractor to see that the representative of the government is acting within his lawful authority.

7. When an informal contract is executed by the contractor, the government cannot then refuse to pay him for goods or services actually furnished by reason of the informality of the contract.

These rules are based upon the facts shown in cases actually coming into court. Such difficulties as the parties in these cases met in their contracts can be avoided by gathering the fruit of their experience.

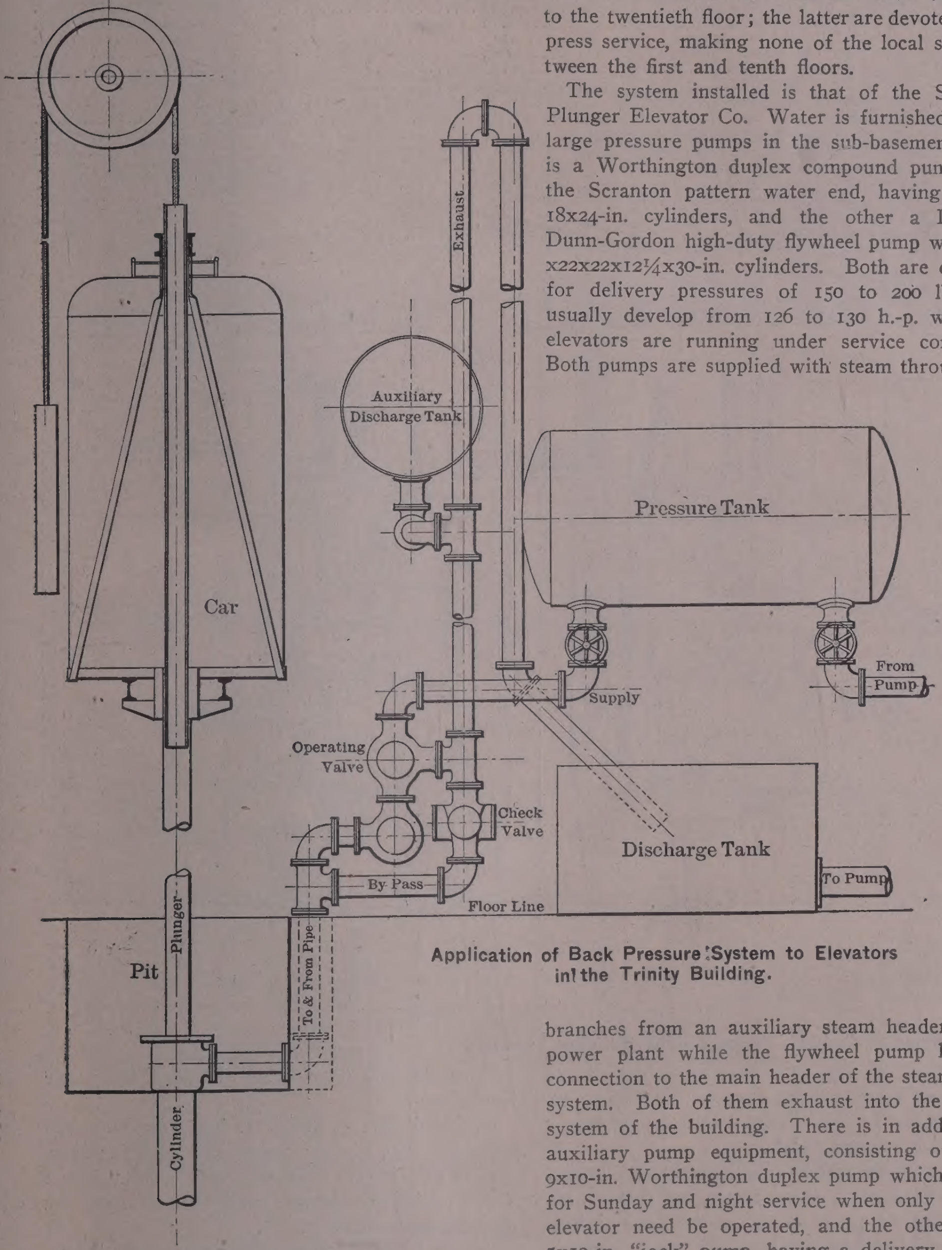
(To be continued.)

A RECORD FEAT IN SHIPBUILDING on the Great Lakes was marked by the recent launching at the Lorain plant of the American Shipbuilding Co., of the 10,000-ton ore carrier, "Jos. G. Butler, Jr.," after a period of only 55 days following the laying of the keel. The latter was laid Sept. 6, and the launching occurred on Oct. 28. The steamer measures 545 ft. over all, 55 ft. beam; 31 ft. deep.

Tests of Elevator Plant in the Trinity Building, New York.

The passenger elevators recently installed in the Trinity Building, 111 Broadway, New York, are of the high-speed plunger type, supplied with water by high-duty flywheel pumps. The building is an office structure 20 stories in height, with basement and sub-basement for machinery. The elevator equipment includes ten passenger elevators and one for freight, five of former of short travel, to the tenth floor only, for the local service, while the other five have the full travel of 282 ft. to the twentieth floor; the latter are devoted to express service, making none of the local stops between the first and tenth floors.

The system installed is that of the Standard Plunger Elevator Co. Water is furnished by two large pressure pumps in the sub-basement. One is a Worthington duplex compound pump, with the Scranton pattern water end, having 21x34x18x24-in. cylinders, and the other a Laidlaw-Dunn-Gordon high-duty flywheel pump with 17¾x22x22x12¼x30-in. cylinders. Both are designed for delivery pressures of 150 to 200 lbs., and usually develop from 126 to 130 h.-p. when the elevators are running under service conditions. Both pumps are supplied with steam through 4-in branches from an auxiliary steam header of the power plant while the flywheel pump has also connection to the main header of the steam piping system. Both of them exhaust into the heating system of the building. There is in addition an auxiliary pump equipment, consisting of a 14x9x10-in. Worthington duplex pump which is used for Sunday and night service when only a single elevator need be operated, and the other a 10x5x10-in. "jack" pump, having a delivery capacity of from 250 to 300 lbs., which is used only on special occasions in connection with the freight elevator for lifting safes, heavy loads of machinery, furniture, etc.



Application of Back Pressure System to Elevators in the Trinity Building.

The piping system for the elevators begins with the delivery lines from the pumps to the pressure tanks, from which the elevator supply mains lead to the individual control valves; there is also a discharge system through which the plunger cylinders empty back into the discharge tank from which the pumps draw. The pressure tanks consist of two steel plate cylindrical tanks, 5½ ft in diameter and 37 ft. long, into which the two large pumps discharge through 14-in. pipe connections and the Sunday pump through a 7-in. line. For the high-pressure supply to the elevator control valves, there are two 12-in. lines of delivery piping, one for the group of five local elevators and the other to the five express and one freight elevators; each control valve has a 5-in. supply connection while the discharge is of the same size. The discharges are returned to the discharge tank by two similar lines of piping of equal sizes. The discharge tank has a rectangular open steel-plate shell 15½x29 ft. in size and 3½ ft. deep. To this the large pump has a 19-in. suction connection and the Worthington compound pump a 16-in. suction, while those for the Sunday and jack pumps are 8 and 6-in. respectively. The jack pump has no delivery connection to the pressure tanks, as it is used only on special occasions and is therefore piped directly to the freight elevator control valve.

The system has the usual standard details adopted by the Standard Plunger Elevator Co., except for a departure in the form of a back-pressure system for the five high-rise elevators, by which a slight saving in their operation is said to be effected. The piping arrangement and check valve for this equipment are illustrated in an accompanying diagram. These elevators discharge into auxiliary tanks located a sufficient height above the discharge tanks to create a considerable back pressure before overflowing from thence to the discharge tank. This tank is connected with the plunger cylinder by a check valve opening toward the latter, the effectiveness of the arrangement appearing after the control valve is shut off on an up-trip of the elevator, when the check valve opens slightly and supplies sufficient water to follow into the cylinder and cause an easy and smooth stop; this arrangement is said to effect a saving of 5 per cent. of the plunger displacement in high-pressure water that would otherwise need to go through the pumps.

A series of tests have recently been made of the elevator system in this building by Mr. Arthur J. Herschmann, which were presented in a paper before the recent meeting of the American Society of Mechanical Engineers. The economy tests are of interest for the pump duties stated which were strongly questioned during the discussion. Mr. Herschmann refers to the tests as follows:

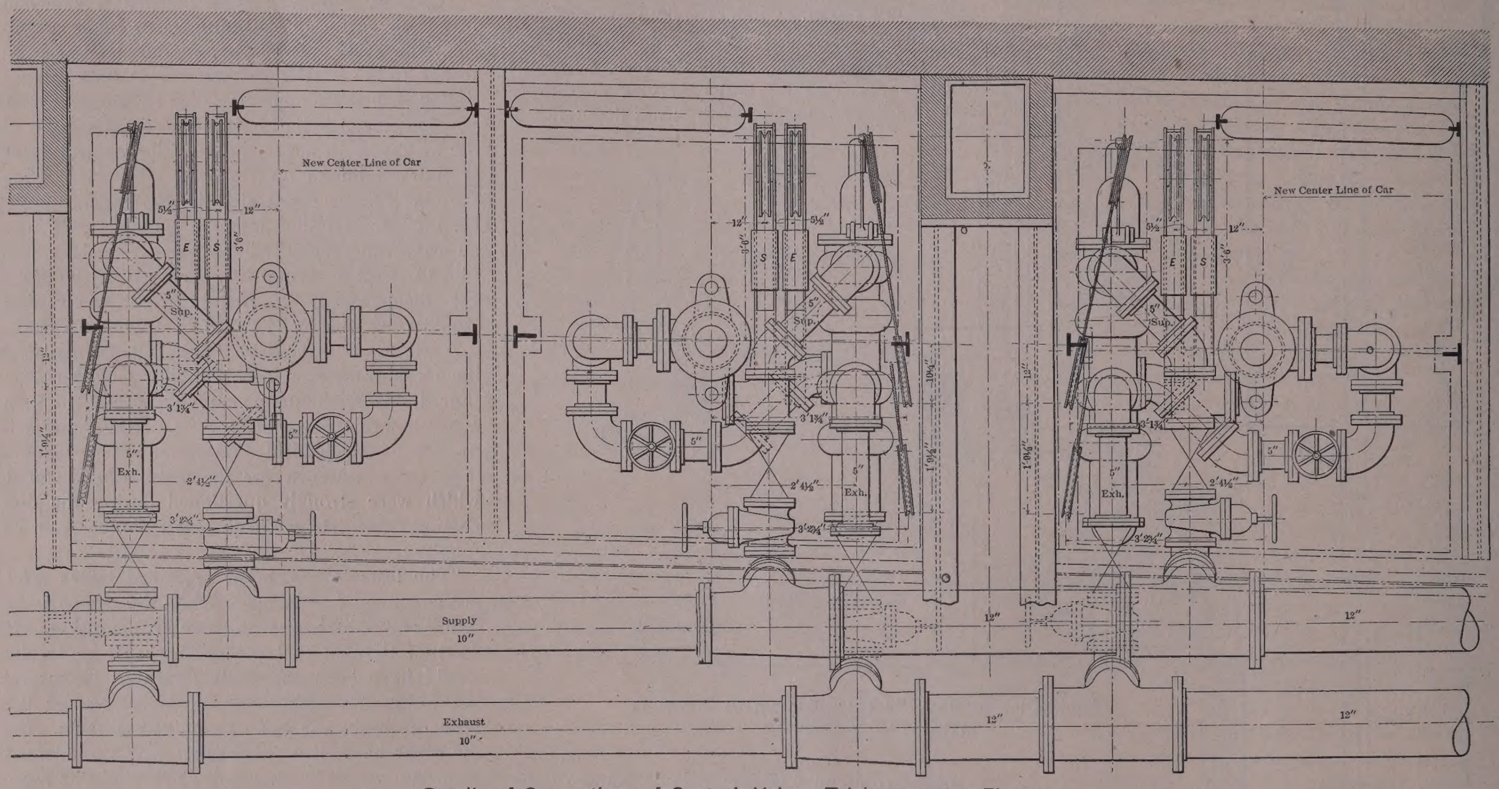
"The tests to which the appended tables refer are commercial tests made while the plant of the Trinity Building was in regular operation. It was not thought that the accuracy of the results would have been materially improved by resorting to greater elaboration in preparing for the tests or in the manner of conducting them. On the other hand, it was held that with the adopted plan data would be obtained which could be more readily compared with those of other buildings and which would, on account of the peculiarity of elevator service in an office building, more correctly define actual economy than data which would result from a dead load test in which intermittency of service would not be portrayed.

"It will be seen that two series of tests are tabulated, the first of Sept. 7 referring to the duplex compound pump, the second of Sept. 8 to the high-duty pump. With the use of the auxiliary steam line it was possible to run the elevator pump on a separate boiler of 350 h.-p., the remainder of the plant as well as all boiler feeding was each day on a boiler of 265 h.-p. It should be noted that, roughly speaking, boilers and pumps were only on half load so that with a heavier traffic economy should be further improved. It will be seen that the flywheel pump saved 31 per cent. in steam over the compound pump, or in other words that the compound pump consumed 44.1 per cent. in excess of the flywheel pump. Costs are figured for service referred to as including necessary losses such as leakage, slip and water consumed by pilots and motor valves.

Data as to the elevator equipment were given as follows: Diameter of all plungers, 6½ in. Thickness, freight and long run, 3/8 in.; short run, 5/16 in. Plunger weights, total of plunger with central rope, freight, 8,425 lb.; total plunger with central rope, long run passenger, 8,460 lb.; total plunger with central rope, short run passenger, 4,000 lb. Counterweights, freight elevator, 8,000 lb.; long run elevator, 7,900 lb.; short run elevator, 4,700 lb. Counterweight ropes per foot, 7.2 lb.; counterweight ropes, total weight, freight 2,150 lb.; counterweight ropes, long run passenger, 2,050 lb.; counterweight ropes, short run passenger, 1,121 lb. Weight of car, frame and panels, freight elevator, 3,500 lb.; long run passenger, 2,500 lb.; short run passenger, 2,300 lb.; each passenger cab, 1,125 lb. Friction each machine, up 500 lb.; down, 300 lb.

Economy Test, Trinity Building, September 7th and 8th, 1905.

	Worthington duplex pump.	Flywheel pump.
Horse-power boilers developed	148.9 average	105.05 average.
Coal burned in the 9 hours	7,000 pounds	4,400 lbs.
Quality and cost of coal	Buckwheat, No. 1; $3.40 long ton	ditto.
Evaporation, coal per pound	6.29	6.93.
Evaporation, coal from and at, dry	6.45	7.10.
Evaporation, coal combustible from and at	8.36	9.07.
Boiler and furnace efficiency	56%	61%.
Coal, cost per car mile	8.04 cents	5.22 cents.
Round trips made by locals, 848—1st to 11th—142 feet.		861—1st to 11th—142 ft.
	8—Basement to 11th—155 ft.—121,660 ft.	16—Basement to 11th—155.5 ft.—124,750 ft.
Round trips made by express, 793—1st to 21st—268.5 ft.		680—1st to 21st—268 ft.
	47—Basement to 21st—282 ft.—226,174⅕ ft.	105—Basement to 21st—282 ft.—212,190 ft.
Number ft. per hour, total (average) per hour	38,648	37,437.
Average number of car miles per hour, 131.74÷9	14.63	127.63 ÷ 9 = 14.18.
Number feet totals for day of 9 hours	347,834	336,940.
Elevator fuel per hour, 777 pounds costing	$1.18	$0.71.
Steam used per indicated horse-power hour, pounds	38.67	25.92.
Steam used per water-power hour, pounds	42	29.14.
Mechanical efficiency of pump, per cent	0.927	0.896.
Indicated pump horse-power (mean of cards)	126.19	130.29.
Water horse-power delivered by pumps	117	116.7.
Steam used per mile car travel, pounds	350.5	252.8.
Fuel used per mile car travel, pounds	53	34.4.
Car miles for day of 9 hours	131.74	127.63.
Revolutions per minute of pump	12	25.7.
Slip total, per cent	4.3	3.87.
Saving of steam over that taken by compound pump		31%.
Coal saved by flywheel, per cent. (same evaporation)		28%.
Water delivered per revolution, actual	99.03	44.09.
Number of passengers in 9 hours	4,500	5,000.
Cost of coal per passenger lifted	0.24 cent.	0.13 cent.
Water horse-power per car mile	7.99	8.23.
Average water pressure during day	176 pounds	177.



Details of Connections of Control Valves, Trinity Building Elevators.

Pressure records were then taken to show the exact behavior of the water in both the hydraulic supply system and in the plunger cylinder. A special form of indicator was rigged up by Mr. Herschmann, by which the variations of pressure were recorded for all portions of the plunger's movement, and several of these cards are presented herewith. The peaks of pressure occur at stops on the down runs, when the escape of water is shut off at the control valve, yet at these times the pressure scarcely ever rises above 300 lb. On the up trips, when the opposite action would be expected, a very uniform decrease of pressure is to be noted which is due to the action of the automatic valve and the back-pressure system. The variation in pressure in the supply mains, shown by the upper diagram in each case, is very slight, varying with the opening and shutting of the control valve.

Special stopping tests were also made by Mr. Herschmann under various conditions of load and service in order to determine the control over the car in matter of stopping. Some of the results are as follows:

No. 3 Express Elevator. Conditions: Stops must be no more than 3 in. out of level; open and shut door at each stop; stops ordered after door was shut.

A, 1st to 21st floors, 6 stops going up, 11, 13, 15, 17, 19, 21st, 1 min. 9 sec.; 6 stops going down, 20, 18, 17, 15, 12, 11th, 1 min. 1 sec.; round trip, 2 min. 10 sec.; water, 170 lb.

B, Up, 1st to 21st, 6 stops, 12, 13, 16, 18, 20, 21st, 1 min. 10 sec.; down, 21st to 1st, 6 stops, 19, 17, 15, 13, 12, 11, 1st, 1 min. 6 sec.; round trip, 2 min. 16 sec.; water, 185 lb.

C, Up, 1st to 21st, 6 stops, 11, 13, 15, 17, 19, 21st, 1 min. 10 sec.; down, 21st to 1st, 6 stops, 20, 18, 16, 14, 13, 11, 1st, 1 min. 4 sec.; round trip, 2 min. 14 sec.; water, 165 to 185 lb.; mostly excellent stops.

As seen above an express elevator made the round trip—1st to 21st floors—with 1,617 lb. of load, stopping six times each way, in 2 min. 14 sec. Doors were opened and shut, good stops insisted on, and no advance orders given.

D, Express, No. 3, 1,756 lb.; water, 185 lb. Base to 3rd, 10 sec., 279 ft.; 3rd to 11th, 15 sec., 420 ft. Up at that speed, overran 11 ft. 6 in., lost 7 sec.; repeated, overran 10 ft. 6 in., lost 9 sec. Down, 21st to 18th, 7 sec., 325 ft.; 18th to 11th, 6 sec., 885 ft.; 11th to 3rd, 14 sec., 450 ft. Overran on 11th floor 12 ft. 6 in.; repeated, at speed of 758 ft., overran 12 ft., lost 14 sec.

E, Same car, 1,915 lb.; water pressure, 190 lb. Up (base to 21st), highest speed 11th to 18th, 531 ft.; average 41 sec. 412 ft. Down (21st to base), highest speed, 18th to 11th, 885 ft., average, 28 sec., 600 ft. Best result overrunning going up 9 ft. on 11th floor at 468 ft. speed, least time lost, 7 sec.

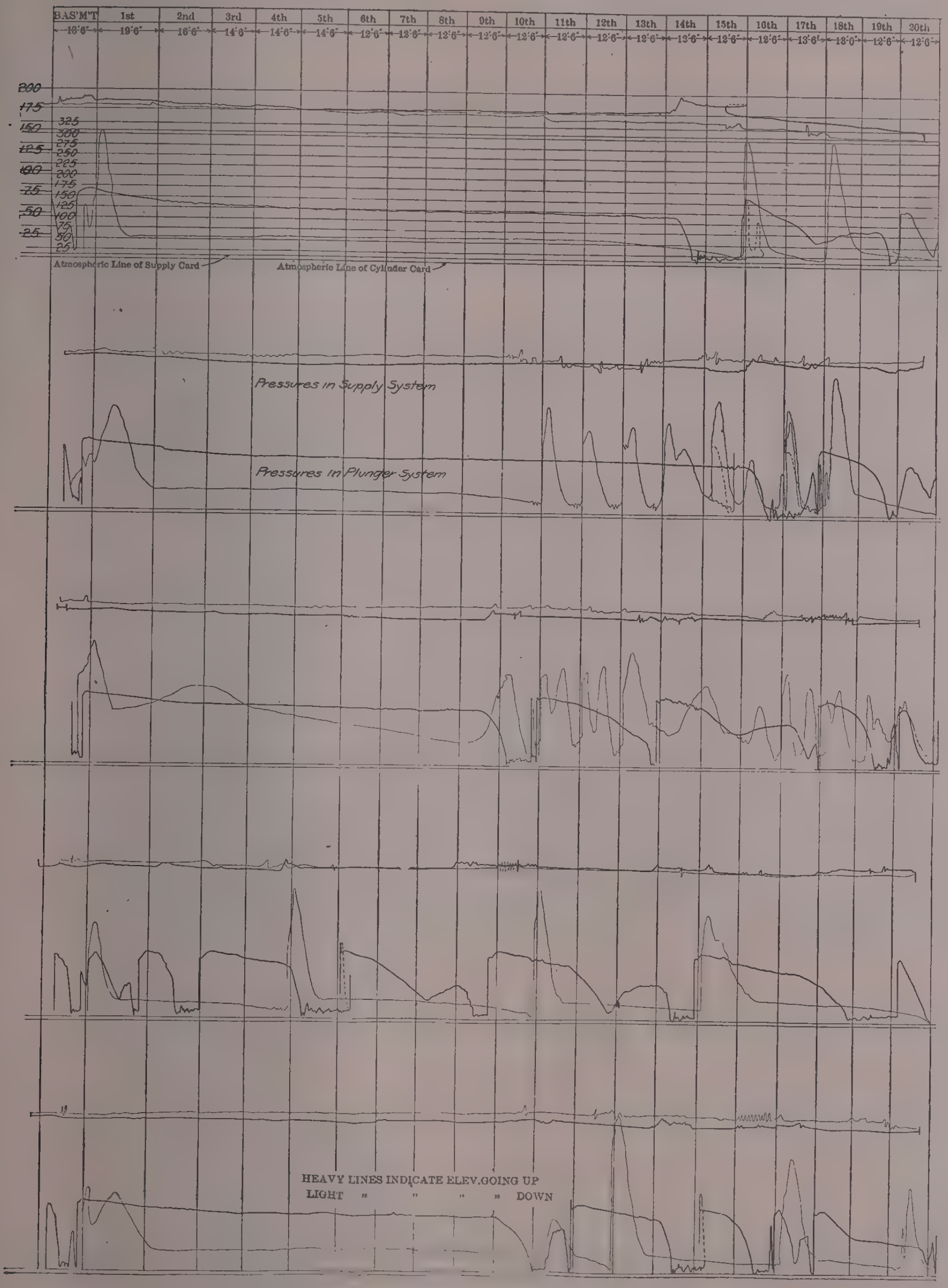
F, Local, No. 5, 653½ lb. load, 185 lb. water pressure. Up, highest, 3rd to 11th, 636 ft.; average, 35 sec., 480 ft.; repeated, same result. Down (21st to base), highest, 18th to 11th, 590 ft.; average, 35 sec., 480 ft.

G, Local, No. 8, 4 men, 653½ lb.; 185 lb. water. Up (base to 11th); highest, 3rd to 8th, 456 ft.; best average, 24 sec., 388 ft. Down (11th to base); highest, 8th to 3rd, 411 ft.; average, 28 sec., 330 ft.; repeated, same result.

H, Local No. 9, same load; water, 185 lb. Up (base to 11th); highest speed, 3rd to 8th, 587 ft.; best average, automatic, 17 sec., 548 ft. Down (11th to base); highest speed, 8th to 3rd, 373 ft.; best average, 29 sec., 322 ft.

I, Local, No. 10, same load; water, 185 lb. Up (base to 11th); highest, 3rd to 8th, 456 ft.; average, 22 sec., or 420 ft. Down (11th to base); highest, 3rd to base, 370 ft.; average, 30 sec., or 310 ft.

In the discussion on this paper Mr. Thomas E. Brown stated that the data it contained are the first ever obtained from a test of the plunger type of elevator by disinterested engineers, and are consequently very valuable. The boiler tests gave results which he considered lower than what might have been expected. The consumption of steam by the Worthington non-condensing compound duplex pump, 42 lb. per water horse-power, was abnormally low, and Mr. Brown stated that 70 lb. was the best guarantee he could obtain from pump makers for machines for elevator service. Checking the figures disclosed no material error, and unless the observations were in error the deduction must be accepted as correct.



Pressure Cards from an Express Elevator.

The economy of the pumping plant for elevator service was not particularly important, in Mr. Brown's opinion, as the following figures showed. The day's run of the compound pump resulted in 131.74 car miles at a consumption of 7,000 lb. of coal; the day's run of the flywheel pump resulted in 127.53 car miles and a consumption of 4,400 lb. of coal, equivalent to 4,540 lb. for 131.74 car miles. There would thus be a saving of 1.1 long tons in favor of the flywheel pump. At $3.40 a ton this would represent a fuel saving of $1,122 in 300 days. In view of the fact that such a pump costs more than twice as much as a compound duplex pump, Mr. Brown questioned whether this saving in fuel charges warrants the use of the higher-class apparatus.

The automatic valve to which Mr. Herschmann specially refers as saving 5 per cent., is a device commonly used with all types of non-circulating hydraulic elevators, Mr. Brown stated, and is intended to prevent a vacuum in the cylinder during the up-motion stops, should the operating valve be closed too rapidly. Any economy resulting from its use was probably accidental, and Mr. Brown could not see how the author of the paper reached the conclusion he did concerning the 5 per cent. saving. The back pressure used to operate the check valve is discharged into an open suction tank and is lost. Had the auxiliary discharge tank been connected directly to the suction of the pump, producing a suction head, a saving proportional to that head could have been attained. If the back pressure were 25 lb. for example, and it were used as suction head, the saving would be 13.9 per cent.

In the opinion of Mr. Brown, the introduction of an automatic check valve, by-passing the operating valve and the automatic terminal stop, is dangerous. Should this valve give out, all the controlling devices would be rendered inoperative, the hydraulic friction greatly reduced and the speed of the car dangerously accelerated. He advised connecting the check outside of the limit stop, so that, in case of a failure of the check, the limit stop would still be in a position to at least retard the approach of the car to the bottom. Mr. Brown referred to an accident that occurred about ten years ago in which several people would have lost their lives had the check not been connected outside the limit stop in the way he advised. The operating valve can be graduated so as to avoid the use of a check valve, but this is not considered a commercially practicable method.

On the Safeguarding of Lives in Theaters.—I.

Abridged from the Presidential Address before the American Society of Mechanical Engineers by Mr. John R. Freeman.

It is a fair and moderate statement that the present practice of the art of fire prevention as applied to theaters and buildings of public congregation is from ten to twenty years behind the fire protection of large industrial works, and true that the fire hazard to theater property in general, as measured by a comparison of insurance rates, is ten times as great for the modern theater as for the modern factory. All of this is unnecessary. The safeguards needed are mostly simple; the main features of some of them are already worked out and well proved within the great factories which engineers build and manage; the additional safeguards required to be worked out, or adjusted for this special case,—the automatic smoke vents, the safe proscenium curtain, the safe warming and ventilation, the proper arrangement of automatic sprinklers in stage and dressing rooms and storerooms, are within the field of the mechanical engineer and are mostly simple problems when serious attention and skill are once directed to them.

In the course of my own studies of the theater and auditorium problem, I have seen almost everywhere conditions affecting the safety and life that would not be tolerated for a moment by the managers of our best industrial works, and all from simple failure to know or to understand. For example, I have seen in one of the best New York theaters the wedge-shaped space beneath the sloping floor of the auditorium used as a storeroom for trunks and properties. This room was also the plenum chamber for the ventilation. Suppose that rats and matches, spontaneous ignition of oily material, or any of the obscure but frequent causes should start even a slow smouldering fire in this room. Why is it not foreseen that the smoke rising through the air ducts in the floor might throw the audience into a panic and cause great loss of life?

In one of the most famous halls in America, I found the portable wooden flooring, used sometimes to level up and transform the main seating space into a ballroom, stored in a dark passageway, which formed the main air chamber between the heating coils and the concert hall, all thus kiln-dried to perfection, and when I showed it to the manager and to an intelligent aldermanic committee and urged its immediate removal, they saw no danger and thought me hypercritical and could not even see that automatic sprinklers would be of use in such a concealed storage space.

In Chicago, within a few months after the appalling disaster at the Iroquois Theater, the aldermen rescinded the rule calling for automatic sprinklers over the stages and rigging lofts of the theaters because the managers believed they "wouldn't do any good" and "might start a panic, should one happen to open prematurely." Every factory manager or mill engineer in this audience will admit the absurdity of such a statement.

In Boston, the law still accepts the non-automatic sprinkler pipe to be opened by hand, a device which has now been generally discarded in factory fire protection in favor of the automatic.

We cannot leave it to the underwriter to make the theater safe against fire. The able president of one of the largest insurance companies tells me, too, that on the whole, the theater class at current rates is profitable underwriting. We cannot leave it with the framing of a good building law. The same underwriter also said to me, "The city of Blank on the Atlantic Seaboard, has a pretty good building law, yet the city is full of theaters that are unsafe, some of them constructed since the building law went into effect." The Chicago building law required automatic sprinklers over the stage; until after the Iroquois, not one had ever been put in. Then in the effort to perfect the enforcement of the law, they cut out the requirement for sprinklers.

The Iroquois and Other Theater Fires.—I first became actively interested in this question by the burning of the Iroquois Theater at Chicago, a little less than two years ago. A prominent manufacturer, two of whose little nieces were among the nearly 600 people that perished, wired me to come over to Chicago and investigate, in a noble spirit, he said, not for the purpose of fixing the blame, but to help us find out how such fearful disasters can be prevented. I examined the structure before any of the wreckage had been moved, listened to evidence before the coroner's inquest, counseled with the Mayor and committee of the Board of Aldermen, questioned eye witnesses and inspected many other theaters in the effort to reach a clearer understanding of their special hazards.

This fire occurred at a Wednesday afternoon matinee in the midst of the holiday season when the theater was crowded largely with pleasure parties of women and children. With admirable promptness, the chief of the public Fire Department and an efficient force of firemen were on the ground within little more than five minutes from the first alarm, but even by that short time, most of the victims had already become suffocated. Some of the cooler headed who apparently followed the maxim for safety, "remain in your seat and avoid crushing at the exit," were suffocated in the gallery, where they sat.

What has been called the irony of fate is found in the fact that the scene of this appalling disaster was the newest of Chicago's theaters, a building of fireproof construction that justified the name so far as the building itself was concerned. Little except scenery, decorations and upholstery was damaged. The great lesson of the Iroquois fire was only a repetition of a lesson that has been given several times before and each time forgotten.

The recurring formula is:

(1) A stage crowded with scenery.

(2) The sudden spread of the flames over this scenery.

(3) The opening of a door in the rear of the stage, an inrush of air.

(4) Scant smoke vents over the stage, an outburst of smoke under the proscenium arch.

(5) Death to those in the galleries.

In 1881, at the Ring Theater disaster in Vienna, with about 1,800 in the audience, careless lighting ignited a "hanging border," a large door in the rear of stage was opened, letting in a blast of air that drove the smoke through the proscenium arch; the iron curtain could not be lowered; special exit doors were found locked; 450 were killed, mostly in the upper gallery.

In 1887, at Exeter, England, fire caught on a stage crowded with scenery. Within about five minutes from the outbreak of the fire 200 were killed, mostly in the upper gallery.

In 1876, at Conway's Theatre, Brooklyn, N. Y., the stage was crowded with scenery; a border caught fire; the blast of suffocating smoke was increased by the opening of large doors in the rear of stage; about 300 were killed, all in the upper gallery.

The obvious suggestion might be, make the scenery incombustible, and the popular belief taken in from old textbooks is that this is a simple matter. Of its difficulties and uncertainties, we will speak later. Suffice it for the moment to say that notwithstanding the paternal care with which the government in England and on the continent looks after all matters of public safety, and notwithstanding the many recipes in French and English publications for making fabrics incombustible, none of these foreign governments, so far as I can learn, specify that scenery shall be subjected to any process of flame proofing. We may make scenery less easily inflammable, so that a match or an electric spark will not ignite the canvas or gauze, but the efficient fireproofing of scenery, so that it will not all burn up if a fire once gets well started on the stage, simply appears to be impracticable. Of all this, we will speak later.

The scenery which burned so rapidly at the Iroquois was all made in England and was first used under the supervision of English law in the Drury Lane Theater in London.

We will, in briefest manner possible, discuss a few of the chief features of the theater risk and means for meeting them.

The Fuel.—The amount of combustible material on the stage in a great spectacular piece is surprisingly large. On the Iroquois stage at the time of the fire, there was more than 10,000 sq. yd. of canvas or 2½ acres, and in addition, about 3,000 sq. yd. or half an acre of gauze. To hang this required more than 10 miles in length of ⅝-in. manilla rope, and in the frames, battens, braces, profiles and set pieces, the stage carpenter estimates there was about 8,000 sq. ft. of white pine lumber. The total weight of this fuel was more than 10 tons, all dry as tinder and all set or hung in a way to give the quickest possible exposure and spread to the flames. The paints used by the scene painter are not dangerous. They are almost entirely put on with water and glue, and they tend to make the fabric a little less readily combustible.

It is a very rare case that so much scenery is found upon a stage, but if, as is more common, it were only one-fourth part as much, it is plain that the fuel supply is sufficient to send out an enormous volume of suffocating gas. Indeed, I have computed that merely the quick burning of this 160 lb. of gauze that hung over the Iroquois stage would heat a volume of air equal to that contained in the space above the proscenium arch to 1,000° Fahr.

There is good testimony to the effect that only about two minutes' time elapsed after the first spark until all the upper scenery was in flames. Only from three to four minutes' time elapsed before the large space of the hanging loft was so filled with fire that the flames and smoke rolled out beneath the proscenium arch into the top of the auditorium; then came suffocation and death.

The main problem is to give prompt and certain vent to this smoke and suffocating gas, elsewhere than through the proscenium arch.

Concerning the Smoke Vents.—The ordinary construction, with a high spacious chamber for the hanging loft above the level of the proscenium arch, makes it a simple matter structurally to keep this fire and smoke out of the auditorium, and no matter how great the mass of flaming scenery, a smoke vent of ⅛ or 1/10 the area of the stage, if instantly opened, would probably have saved all of this terrible suffocation at Chicago, at Exeter, at Brooklyn and at Vienna.

To one who has not before been behind the scenes and up to the gridiron, the surprising thing about a stage is the great head room, commonly 70 ft. from stage to gridiron and 80 or sometimes 90 ft. from floor to roof, and necessarily more than double the height of the proscenium arch, into which are hoisted the great sheets of canvas on which the scenes are painted.

The conditions are plainly similar to that of the fireplace in our living room magnified 10 or 20 diameters. Note how admirably the high space over the stage screened by the arch, is adapted to give the best chimney draft, and not give us a smoky fireplace. An ordinary rule is to make the throat of the chimney at least 1/10 the area of the fireplace opening, or it may be stated that the space through the damper should be ⅛ the area of the hearth, and when we simply provide an adequate chimney area and a damper that will surely open, we shall have adopted a safeguard that would have saved four-fifths of those who perished at the Iroquois, regardless of defective curtain, defective exits and absence of fire hose on the stage.

The idea of a large ventilator over the stage, expressed in the building rules of many cities, is all right, but the execution is commonly all wrong, and needs some good engineering in order to provide a design of damper that will be sure to work.

Doubtless there are many good smoke vents here and there that have been designed and built with skill and conscience, for the problem is not so very difficult, but I have not yet seen one of these vitally important pieces of apparatus in which the design had been worked out with reasonable degree of perfection of detail. "Something good enough to pass the building inspector" appears to have been the current specification, instead of the proper specification of "something of ample area that will be sure to open wide instantly, without human intervention, and that cannot be stopped by warping, settlement, obstruction, frost, snow, rust, dirt, or ordinary neglect."

I am led by computation and precedent and the need of some factor of safety, to concur in the wisdom of the skylight ratio of one-eighth or one-tenth of the stage as already specified by the building laws of the great majority of our American cities, and believe it wise to base it upon the gross area of the stage floor rather than on proscenium opening, or cubical contents of the stage.

(To be Continued.)

The Effect of Vanadium on the physical properties of steel has been studied at some length by M. Leon Guillet, who recently read a voluminous paper on the subject before the Iron and Steel Institute. These effects he summarizes as follows: On normal steels it produces a very distinct increase in the tensile strength and elastic limit, and has only an insignificant influence on elongation, contraction and resistance to shock; it also slightly increases the hardness. On quenched steels vanadium considerably increases the tensile strength and elastic limit without affecting the brittleness. In M. Guillet's opinion it ranks in the same class with carbon in the intensity of its influence on the properties of iron alloys. Alloys of iron, carbon and vanadium are more sensitive to heat treatment and mechanical handling than ordinary steels. Some of the quaternary alloys, such as iron-nickel-carbon-vanadium, also have properties making them of possible value for a number of purposes.

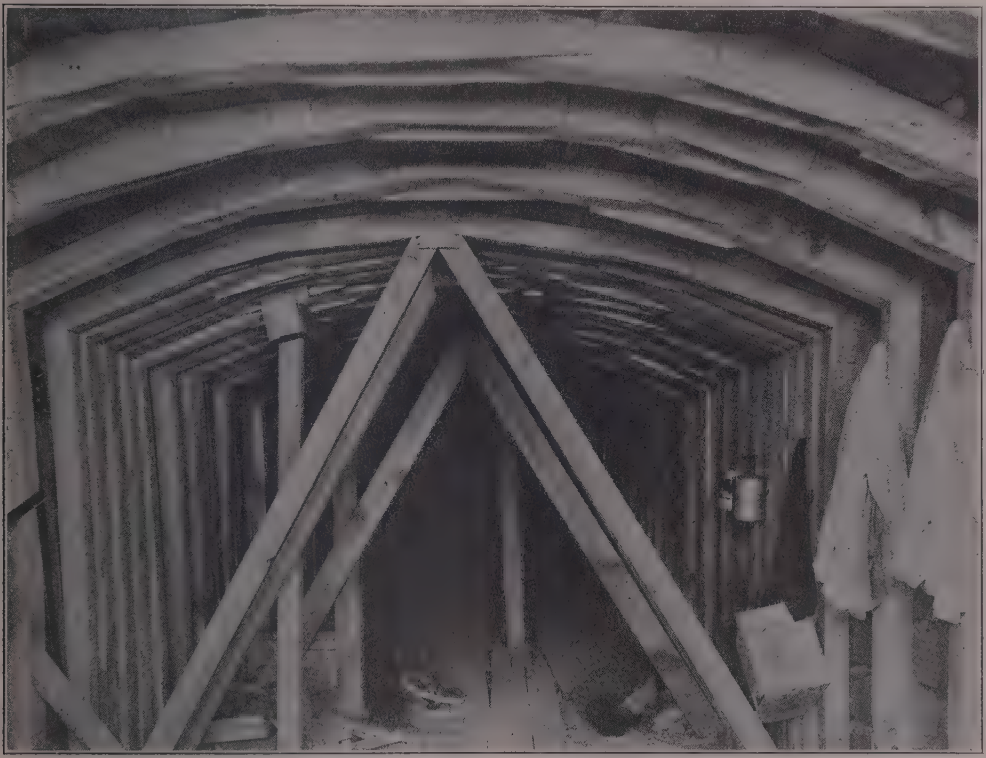
Tunnel Construction on Salt River Reclamation Project, Arizona.

By Beverly R. Harrison.

In connection with the irrigation works now being constructed by the United States Reclamation Service on Salt River, Arizona, it was necessary to drive 15 tunnels, of a total length of 9,000 ft., through clay, sand, quicksand and solid rock. Fourteen of these tunnels are along the power canal, and one is a sluicing tunnel at the dam site.

The power canal that is to furnish power for the building of the Roosevelt dam and for pumping underground water heads 19 miles above the dam and traverses a rough and broken country. The tunnels along its course vary in length from 80 to 1,700 ft.

Tunnel No. 1 at the point where the water is taken from the river is 1,700 ft. in length, and probably offered more difficulties than any other on the project. For 600 ft. it passed through boulders that were embedded in quicksand and varied from small cobbles to masses weighing several tons. As this sand would run like water, it was necessary to use very heavy timbering. The finished section of this tunnel has a width of 9 ft., and a height of 8 ft. to the apex of the arch, but in order to allow for the timbering the excavation was made 12 ft. wide and 11 ft. high. Square sets of 10-in. timbers were placed 2 ft. apart from center to center and inside of these an arched set was placed for extra strength, as well as to give the proper section to the tunnel. The breast of the tunnel had to be boarded solid, and the lagginng driven ahead for each following set. The greatest difficulty occurred when big boulders were encountered. These had to be dealt with separately and worked out an inch at a time, regardless of size or position, as an attempt to break them with powder would have caused a cave or run. This 600 ft. of bad ground was worked from four headings, with two shifts at each, and an average of 6 ft. per day was made from the four. The remaining 1,100 ft. of this tunnel ran through indurated sand, which required only the standard arched section of timbering lagged overhead. The concreting followed the excavation as rapidly as possible.



Timbering in Intake Tunnel before Concreting.

The second tunnel was about 160 ft. in length. This was started from the west portal and for half the distance ran through good material. Near the center, however, quicksand was encountered, and the method of driving and timbering used in Tunnel No. 1 was resorted to. As there were no boulders the work was not so difficult.

Tunnels No. 3 to 11 ran through principally indurated sand and clay, which was usually very favorable for rapid and economic work. Nevertheless, careful inspection and secure timbering were necessary. Nos. 12 and 13, 180 and 80 ft. in length, respctively, are through sandstone and were driven with the same dimensions as the canal section.

The last tunnel to be constructed was the penstock. This is a circular tunnel 620 ft. long, and 8½ ft. in diameter. It has a fall of approximately 200 ft. from the mouth of the canal to the turbine. Before work could be begun on this tunnel it was necessary to excavate out of the perpendicular cliffs the site for the power plant, which is 23 ft. above the river. The tunnel starts at the back of the plant at the elevation of the floor.

On February 28, 1905, work was begun on the lower end of the penstock by hand, the temporary power plant erected for driving the tunnel being made useless by floods. Until May 1 all material and supplies were packed in on the shoulders of men along precipitous canyon sides, shelving rock and rolling boulders, and passed down the vertical cliffs by means of ladders and ropes. By May 1, 110 ft. of tunnel had been driven and the floods then subsided to such an extent that by building several hundred yards of road high up on the side of the canyon it was possible to get wood and supplies through.

Several weeks were spent in repairing the wrecks made by the floods and perfecting organization and detail. An engine for lowering the rock broken by the blasting had to be erected. A rope was passed over a sheave, which was fastened to a horizontal bar placed behind the machines, and the loaded cars were lowered and the empties pulled up. Notwithstanding the fact that an exhaust fan with 7-in. piping was used, the heat and gas were intense, it being a peculiarity of this climate and elevation that all underground raises have no natural ventilation. In this tunnel heat was greater than usual, due, undoubtedly, to the proximity of subterranean hot springs. The work was done with two eight-hour shifts, and on July 16, 1905, the driving of the tunnel was completed and the machines were pulled out.

While the tunnels on the canal were being constructed the sluicing tunnel at the dam site was being driven. This tunnel is 13 ft. wide, 11 ft. high, and 480 ft. long. It is located on the grade of the river bed, and passes through the solid quartzite and sandstone. Machine drills driven by compressed air were used in its construction, and it was worked from two headings. While the actual construction of this tunnel was simple blasting and the hauling away of the broken rock, the work presented many great difficulties. Three times rise in the river flooded both portals and the long approaches with mud and river debris, which had to be trammed out in practically water-tight cars. Another bad feature was the intense heat, which was the direct cause of the death of two of the men. Several hot springs were encountered and the temperature rose to 130° Fahr. This water emitted a steamlike vapor which was almost suffocating. The men worked stripped to the waist and came out at short intervals for a breath of air.

The labor was done by whites, Mexicans and Apache Indians. The white labor was not of the best class, and when skilled miners were needed there was difficulty in manning the work, especially on machine drills. Machine drill men receive big wages everywhere and are always in demand, consequently they do less traveling than any other class of labor. In tunnel work driven by hand there was less difficulty in getting experienced workmen. The Mexicans, when selected, were very efficient and equal to any white labor found here. The Indians are simple and child-like, without experience, but for all routine work such as pick and shovel, they are very good, better than the average white labor of this class. The climatic conditions seem to have a tendency to enervate the white man's body and mind, and to make him inferior to the same class of labor found elsewhere.

A NEW SIX-CYLINDER GAS ENGINE of the horizontal opposed type has recently been built by the Wolseley Tool & Motor Co., of Birmingham, Eng., for the General Electric Co. It has six 9-in. cylinders with 10-in. stroke, arranged three on opposite sides of a single crank-case, and is rated at 140-h.-p. at 420 r.p.m. It has double valves for both the admission and exhaust of each cylinder and is fitted with the low-tension "wipe spark" and high-tension "jump spark" methods of ignition, the latter being intended for regular operation. All gear shafts and cams are contained in the crank case and air for the carburetors is drawn from the crank case, which both ventilates and removes gas leakage from the latter. The most novel feature is the method of starting with ordinary black-powder blank cartridges which are inserted in the firing chamber of each cylinder through a special form of breech-block having a trigger operated from the spark cam; each cartridge is capable of producing about half the usual pressure within the cylinder so that three of them are capable of starting the engine. Air for the carburetor is drawn from the crank case so as to utilize leakage past the piston rings. The engine under test showed an average duty of 0.607 pint of gasoline per horse-power-hour.

Electric Motors for Heavy Intermittent Loads.

The steady advance made by electric motors into the field of such severe service as heavy hoisting or rolling mill operation is most interesting to observe. Motors have been used for some years in light hoisting and for operating the auxiliary apparatus of steel mills. It is only recently, however, that they have been installed for regular industrial operation where heavy intermittent loads must be carried, and some statements on the subject, in a paper on electric motors and their applications, read by Mr. W. Edgar Field before the Engineers' Society of Western Pennsylvania, are accordingly of special timeliness.

Eight and a quarter inch rolls at the Remschied Works are driven by 100-h.-p., 225 to 350 r.p.m. motors for rolling tool steel from 1½-in. bars, and 1,200-h.-p. compound motors are now being installed at the Phœnix Mills for reversing rolls. A 1,500-h.-p. motor has been installed at the Pittsburgh Reduction Co. works for several months for driving blooming mills. Two 1,500-h.-p. compound wound, 100 r.p.m. motors, suitable for 25 per cent. increase in speed are now being installed at the Edgar Thomson Works of the Carnegie Steel Co. for rolling rails.

Although motors are now used in a few mills for driving the smaller rolls, it is believed by most mill and electrical engineers that they will eventually be used for driving the entire mills. Mill motors in general must stand an excessively intermittent load and the flexible connection which electric motors furnish between the prime mover and the load will prove a great saving in repairs over the steam driven rolls, in Mr. Reed's opinion. When the mills have their own generating plant certain variations in line voltage are generally permissible. When large motors are used for blooming mills or similar service it is of great importance, however, to flatten out the current peaks which will develop at overloads such as those produced when bars enter the rolls. A system which will greatly assist in reducing these peaks and is especially applicable for infrequent starting and reversals consists in mounting a heavy flywheel on the shaft of a compound type motor, the motor being so designed that its speed will drop enough at a predetermined overload to allow the inertia of the flywheel to automatically take the overload. By properly designing the motor and flywheel the overload at the motor and power house can be kept within reasonable limits so that no disturbing effect will be felt by other motors on the circuit. In order to get the best efficiency under normal loads when a wound rotor induction motor is used with this system, a resistance is automatically thrown in the rotor circuit at a predetermined overload, thus lowering the speed and allowing the flywheel to take the overload.

In cases where the voltage regulation of the system from which power is taken must be fairly good a system, similar to the "Ilgner" system, which has been used in Germany must be applied. It is similar to the Ward-Leonard system with the addition of flywheel consisting of a motor-generator set, having a heavy flywheel mounted on their common shaft. The motor is either alternating or continuous current, having the compound characteristics so that the flywheel will take the overload; the motor is connected directly to the supply circuit. The generator is a compound wound continuous current machine, the shunt field being separately excited from a machine mounted on the shaft. The generator current is used for operating a continuous current motor which is excited from the generator exciter and is connected to the rolls. The speed of the motor can be changed by varying the exciter current of the generator. The efficiency of this system at low speeds being very good. This system can be applied when it is necessary to reverse the rolls, as it is only necessary to reverse the generator field to reverse the direction of the roll-driving motor. The above system is now used for operating 18-in. rolls at the blooming mill of the Bethlen-Falva Iron Works, Germany. The motor is a 600-h.p., 5,800 volts, 305 to 375 r.p.m. motor. The generator, good for 100 per cent. overload, is a 500-kw., 510 volts, 300 to 365 r.p.m. The flywheel weighs 20 tons and it absorbs 16,000 h.-p.-sec. when the speed changes from 300 to 365 revolutions. The roll-driving compound motor has 200-h.-p. normal and 600-h.-p. overload capacity and runs at 60 to 110 revolutions. A 12-ton flywheel is mounted on this motor shaft. The roughing mill has 14-in. rolls and is driven by a motor having the same capacity as the blooming mill motor, but runs at 150 to 230 r.p.m. approximately and has an 8-ton flywheel. It is stated that the load fluctuations at this plant are very small and constant power is taken from the supply mains.

Portal of Tunnel on Power Canal, Salt River Project.

An Electrically-Operated Rolling Mill at the Queensberry steel works of Willans & Robinson, Ltd., is favorably criticised by Mr. R. W. Birkett in "The Engineer," of London. It is a three-high 15-in. bar mill with roughing, bolting and finishing rolls. The main shaft carries a 15-ton flywheel grooved to receive a rope drive from a 275-h.p., 400-volt, compound-wound motor. Running light at full speed the current consumption is 80 amperes. When a billet 6-in. square is introduced, the current jumps up to 550 amperes, but the flywheel immediately takes the load and the current drops to 200 amperes. On the finishing pass such fluctuations are not noticed. After studying the operation of this plant Mr. Birkett is confident that the addition of a battery and automatic reversible booster to the generating plant furnishing current for running the mill will not cause any trouble in running the power plant.

Hair Cracks, Crazing and Map Cracks on Concrete Surfaces.

By Albert Moyer.

The appearance of hair cracks on a concrete surface is a disfigurement, the cause and remedy for which have not received the proper study that so important a subject justifies. The cause of this trouble has been investigated from time to time, but heretofore the conclusions drawn have been very incomplete.

Hair cracks, being entirely on the surface, do not indicate a weakness in the concrete; in most instances they are not greater in depth or width than that of a coarse hair. A rough-surface concrete does not display these objectionable features to as great an extent as does an even-troweled face, on which surface they are very apparent, especially in damp or wet weather. Often these cracks do not appear for several weeks or months after the concrete has set hard.

A practical worker in concrete is not as much concerned with the cause of hair cracks and crazing as he is interested in their effect and remedy. It often requires investigation as to cause to arrive at a correct solution of the trouble and thus apply permanent remedy, otherwise we would be simply dealing with symptoms. Research conducted along theoretical lines seldom bring practical results, therefore the writer will endeavor to eliminate theory as far as possible. His investigation has been founded on the reverse practice: that of noting and observing very carefully the practical results both as to effect and remedy and then endeavoring to explain these conclusions by theory.

It has been known for some time that very wet concrete is more apt to craze and show these undesirable hair cracks than dry concrete. Dry concrete is objectionable from the standpoint of strength and density; and therefore its use cannot be advocated simply because hair cracks are to some extent avoided. Investigation and practical demonstration leave no doubt of the fact that in wet concrete a portion of the flour or very finest particles of the cement is carried to the surface by the action of the excess water which is being absorbed by the atmosphere. This excess water is to a great extent drawn from the interior of the stone to the exterior, carrying with it the finer particles, which, being deposited on the surface, form a richer mortar than is contained in the body of the concrete. Under certain conditions these fine particles deposited on the surface practically form a coating of neat cement.

Neat cement or the richer mortars are found to be much more liable to crazing than mortars containing a larger proportion of sand or finely crushed stone. This is particularly true in the manufacture of cement stone by the use of sand moulds in which the mixture is poured very wet. It has also been noted that, when the stone is properly seasoned by keeping the surface covered with a thick layer of very wet sand, or when the stone is immersed entirely and for some time in water, the trouble has been overcome almost entirely. These hair or map cracks would be entirely eliminated for all time if the stone were immersed in water for a sufficient period to allow the complete crystallization of the cement. This, however, is not always permitted by convenience or economy.

Lower Face of Sluicing Tunnel, East Side of Dam Site, Salt River Project.

The crazing of neat cement is apparent in test pats for laboratory purposes, when these pats are exposed and allowed to set and harden in air, but if they are protected in a moist closet and afterward immersed in water for a period of at least 28 days, no hair cracks or crazing will result

A carful examination of these cracks led to the conclusion that they are due entirely to a contraction of the surface, the same contraction not taking place in the body of the concrete.

Experiments made by Prof. Swain and Prof. Bauschinger demonstrate that neat cement contracts when set and hardened in air. This applies to all brands of high grade Portland cement. Further tests demonstrate that this contraction increases with age up to a certain period. The same authorities demonstrate that a mortar made of one part Portland cement and three parts sand, hardened in air, shows contraction, but less in proportion than the neat cement. It is obvious that this bears out the practical investigations regarding concrete and cement stone which have been described above; that is, hair cracks are due to contraction of the surface and that this contraction is due to the fact that the concrete has been hardened in air.

The following results were obtained by investigations made by the same authorities and others showing the effects of neat cement and mortar when hardened under water. The test pats or cubes of neat cement and mortar, after the final set, were immersed and kept under water for a considerable period of time. The results prove that neat cement when hardened under water shows a slight expansion, while mortar composed of one part Portland cement and three parts sand shows an expansion, but less in proportion than the neat cement.

Reducing these conclusions to figures and taking the average results obtained by various authorities, figuring the expansion and contraction in percentage, the writer finds the following results:

Neat Portland cement hardened in air at the end of sixteen weeks shows a 0.15 per cent. contraction.

One to three mortar hardened in air at the end of sixteen weeks shows a 0.05 per cent. contraction.

Neat Portland cement hardened under water at the end of sixteen weeks shows an expansion of 0.05 per cent.

One to three mortar hardened under water at the end of sixteen weeks shows an expansion of 0.015 per cent.

Without going further into the matter of figures it is safe to state that the expansion and contraction is less for shorter periods than sixteen weeks and that the percentage will be a trifle greater if carried beyond sixteen weeks or up to six months or a year.

We can, therefore, conclude that in a rich mortar there is more neat Portland cement on the face, and, therefore, a greater percentage of contraction of the surface; also that a less rich mortar will show a proportionately less percentage of contraction, and that if the concrete were kept wet and protected (which is equivalent to hardening under water), hair cracks and crazing would be avoided.

In the past this trouble has been partially overcome by brushing off the surface of the concrete or cement stone with a stiff steel brush, or by scrubbing the surface with a cement brick and wet sand, thus partially removing what might be termed a neat cement face. It has been found, however, that this does not entirely overcome the trouble, the remedy proving but temporary, the cracks appearing several months afterward. The brushing or scrubbing is merely an assistance; the real remedy lies in keeping the surface thoroughly and continuously wet as long as possible. It is unfortunate that this rule is seldom observed, and that in its non-observance good results are sometimes obtained. The worker in cement is thus influenced to disregard a matter of considerable importance in concrete construction. That good results are obtained from a disregard of these principles is largely a matter of luck. If the weather be damp for a number of days after the concrete has set, the object has been partially brought about by nature; then again, the surface may have been so placed as to escape exposure from the wind or sun which would tend to dry it, and was kept wet by the excess of water in the concrete. It is desirable to have the surface of the concrete or cement stone as near the same texture as the body of the concrete.

The only permanent remedy which will eliminate entirely these objectionable features is the removal of as much of this excess of neat cement collected on the surface as is possible as soon as the moulds are taken down. The surface should then be kept wet by the application of wet sand sprinkled from time to time with water, or hanging wet cloths over the perpendicular surfaces, keeping the exterior wet and the cloths wet by sprinkling or by any other method which will accomplish this result. The surface should be kept continuously wet for a sufficient length of time to enable the cement to attain ultimate crysallization. By so doing the effect is practically the same as that of hardening under water. It is reasonable to conclude that if so treated the surface will slightly expand but not to a greater extent than the body of the concrete which is already wet.

It is not amiss to bring this whole subject as prominently as possible before those having charge of concrete construction, endeavoring to impress upon them the necessity of keeping concrete protected and thoroughly and continuously wet for as long a period as economy will permit.

THE ELECTRIC TRACTION EXPERIMENTS of the Swedish Government Ry., while limited in their scope, promise to be very thorough within their field. Direct-current systems were ruled out, as not applicable to long-distance main line service. The three-phase system was ruled out on account of its difficult speed regulation and great complexity in conductors and line wiring. Consequently the administration's experiments will be confined to single-phase operation, for which purpose it will use a Westinghouse locomotive, a Siemens-Schuckert locomotive, and motor cars equipped with the Allgemeine Elektricitäts Gesellschaft's apparatus, designed by Dr. Eichberg. The experiments will cover doubtful features of power station, line and rolling stock design, and it is proposed to carry them far enough to furnish accurate data concerning the advantages, drawbacks and cost of electric operation under service conditions. The power station can furnish current with frequencies of 15 and 25 cycles and pressures of 3,000 to 37,500 volts. The experimental track is nearly 7 miles long, and will be extended later. A description of the Westinghouse locomotive was printed in this journal some months ago. The German locomotive has three axles, each driven through gearing by a single-phase series motor with a normal rating of 100-h.-p. It weighs about 32 tons.

The Union Engineering Building.

The public competition instituted by the joint committee for the selection of architects for the planning and erection of the buildings presented by Mr. Andrew Carnegie for the American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Institute of Mining Engineers, and the Engineers' Club, resulted in the presentation of twenty-six sets of plans for the building. After a careful examination of these plans, the committee appointed Messrs. Hale and Rogers, and Henry G. Morse, associate, architects, for the three engineering societies, and Whitfield & King, architects, for the Engineers' Club. The work on both structures is now well advanced, and the committee has issued a report on the Union Engineering Building, explaining its general features, which are substantially as follows:

It will be recalled that the site of the Engineering Building on 39th St., between Fifth and Sixth Aves., covers five city lots, giving 125 ft. frontage and 100 ft. depth. The building law of the City of New York requires that a building shall occupy only 85 per cent. of the lot area. Advantage is taken of this requirement to have space on all sides of the building, thus giving the building a monumental appearance. The building utilizes 115 ft. of the 125 ft. front, and 90 ft. of the 100 ft. depth.

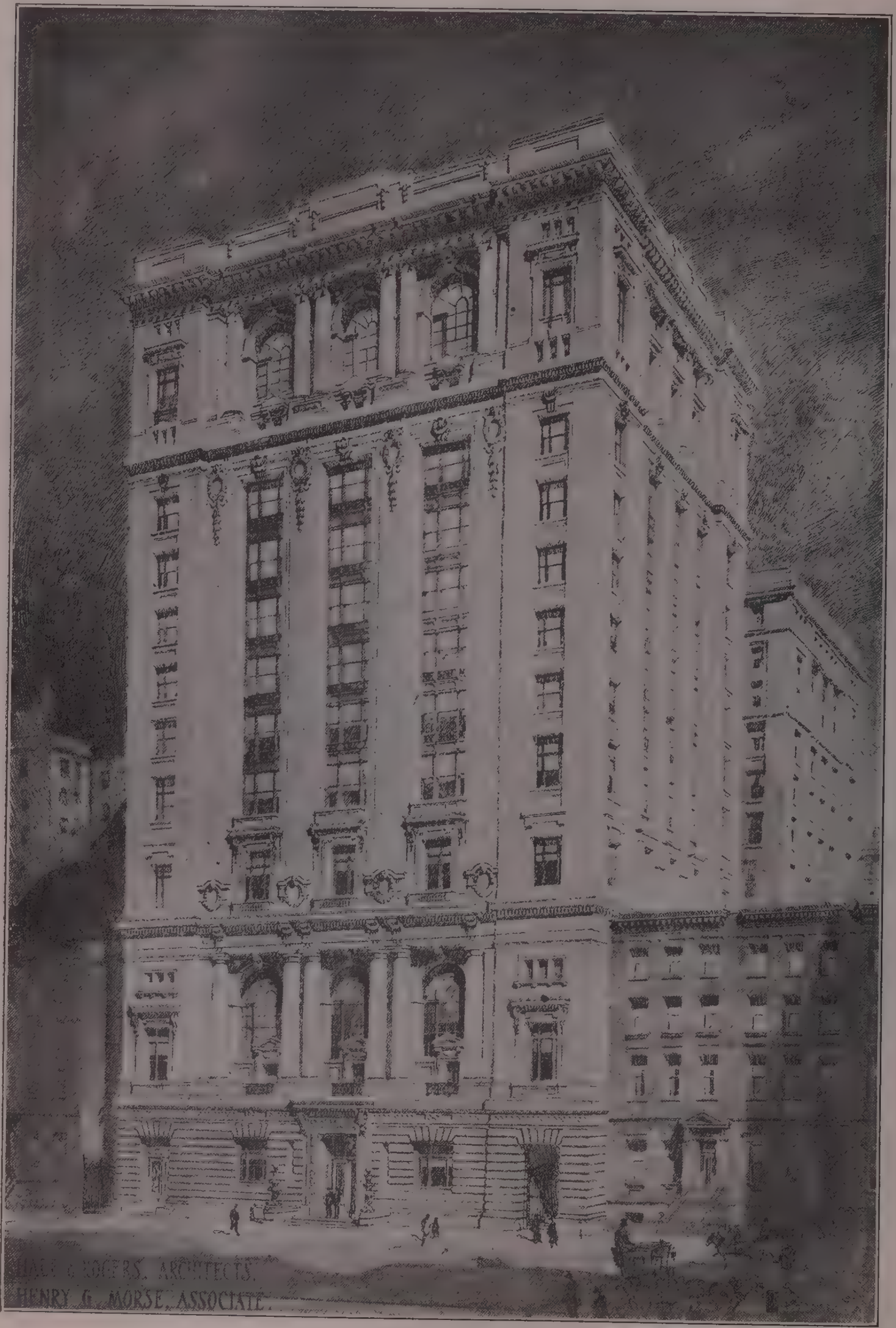
The Engineering Building must serve, primarily, the convenience of each of the individual societies which enter the building as founders. This has been secured by the proposed arrangement of the office floors. The purposes of the rooms assigned will be made clear from their designations on the plan of one of these floors. The working offices of the representatives of the society, the reception room, board and committee rooms, important elements of the life of the society, are on the desirable south front and are favored by the windows which look to the eastward.

The building must supply to the three national founder societies and also to such other organizations as may be invited to participate in its benefits as associates, such meeting rooms and auditoriums as will be required for the annual meetings, the public reading and discussion of papers, and for scientific lectures and demonstrations. In view of the number of participant societies for which provision has been made, the Committee have thought it advisable to arrange for a number of assembly rooms suitable for various uses.

One of these, primarily designed for the national societies' meetings and for those of other large bodies, has been made to accommodate 1,000 persons. This limit is set as being as large a number as can be expected to hear clearly the voice of a speaker. The location of this large auditorium is on the first floor above the street, so as to make elevator service for it unnecessary. Attention is directed to the large foyer and generous corridors, which give ample space for withdrawal from the large assembly hall. The ample provision for exit also at the four corners of this floor, is to be specially noticed as a desirable provision for safety. To enable auditors in the back of the auditorium to see clearly such diagrams and illustrations as may be on the stage the seats are arranged on a grade conforming to best modern practice in theatres. This parterre arrangement enables coat-rooms to be provided opening from the outer corridors, and special consideration has been given to secure rapid service with large numbers in attendance. It will be noticed, further, that the large auditorium floor is reached from the great central rotunda on the street floor, by generous stairways, and that it can also be reached from carriages entering the driveway and moving continuously as they receive or discharge their passengers. The room for preparing apparatus and exhibits for the stage is conveniently served by a large freight elevator, so that heavy machinery and apparatus can be easily handled.

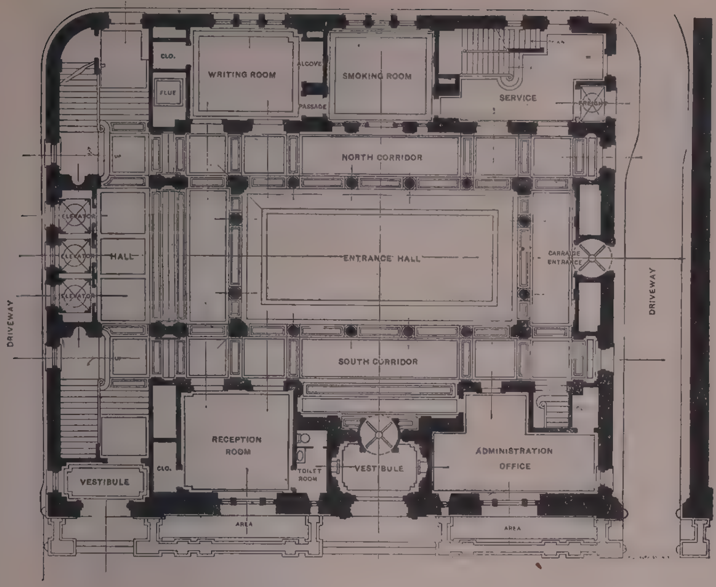
On the floor above the large auditorium are two assembly rooms, 51x66 ft. and 29x66 ft., respectively, occupying the principal portion of the area These assembly rooms may be used independently for lecture purposes, or one may be made auxiliary to the other and used as a foyer or conversation room. As to the two rooms adjoining they may be used in common when desired, as, for instance for purposes of general reception or conversazione. Auxiliary smaller rooms on this floor are provided, and provision is made for the service necessary for light refreshments or luncheon.

On the next floor above, a number of small lecture halls are provided suitable for ordinary meetings of scientific and engineering societies and for meetings of sections at the time of general conventions of national organizations. It is expected that there will be a great demand for the small meeting rooms, for scientific purposes. They will be supplied with electric current, with compressed air and with gas and water. The meeting rooms of all sizes will be fitted for the use of the projection lantern, and will be unique in their completeness for the purposes for which they are intended. The board rooms of the society floors will be large enough for the holding of small professional meetings when occasion may require.

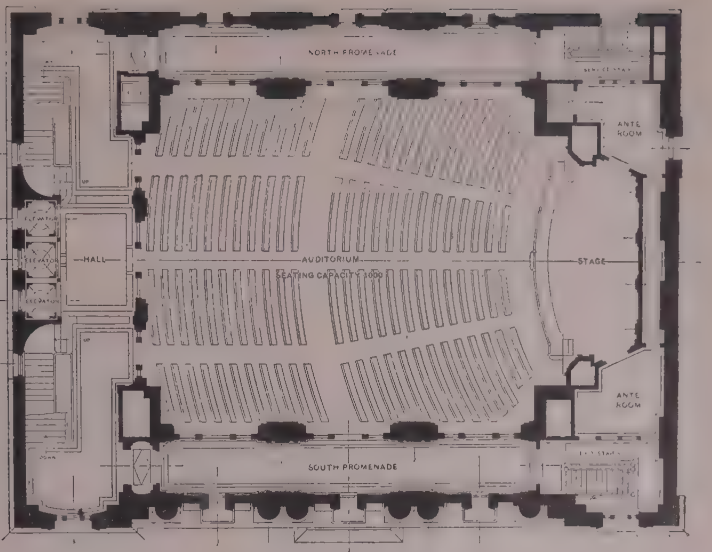

HALE & ROGERS. ARCHITECTS.
HENRY G. MORSE, ASSOCIATE.

Elevation of Union Engineering Building, New York City.

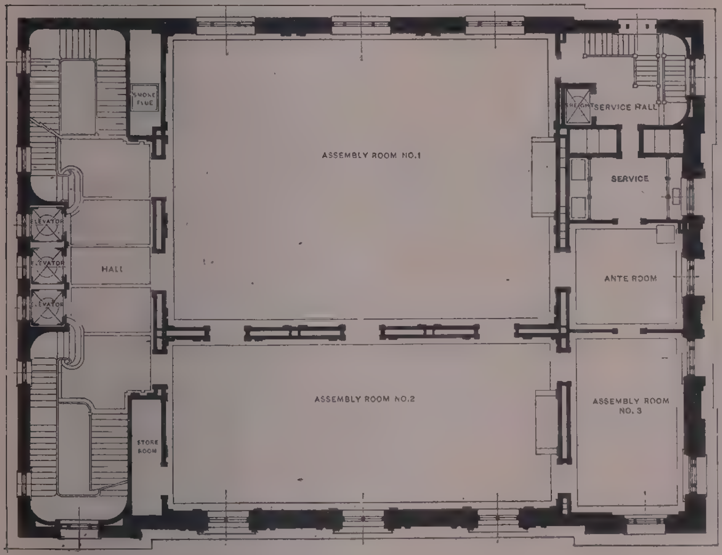
A crowning detail in the planning of the building has been the provision on the two upper floors for the libraries of the various societies. It is the purpose of the societies so to administer the library of each that by bringing them together there shall be created a working and reference library of the highest possible value and completeness as respects engineering science and practice, which shall be unequaled anywhere. The societies have recognized that there is before them an unexampled opportunity, and it is their desire to avail of it to the highest degree. In seeking this end the entire top floor is to be devoted to reading and reference rooms, to working alcoves, to rooms for photographic reproduction, and for drawing and similar library work. The roof will be specially constructed to secure the best illumination. The location of the reading rooms at the top of the building will be quiet, cool, airy, and



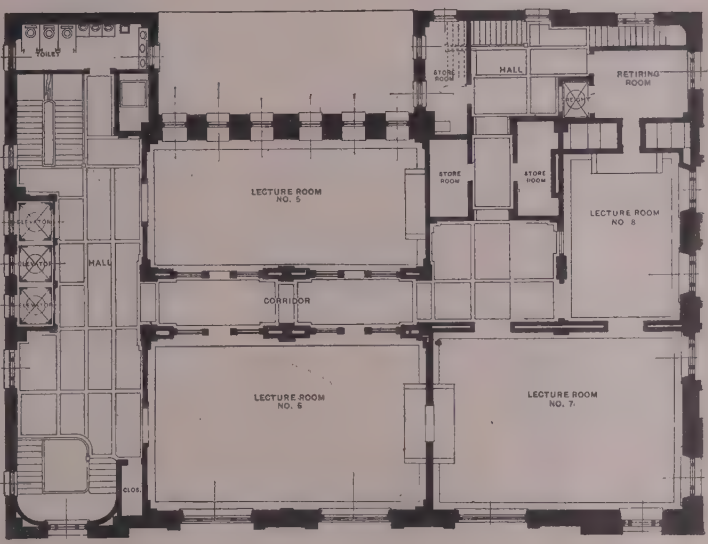
Plan of Entrance or First Floor.



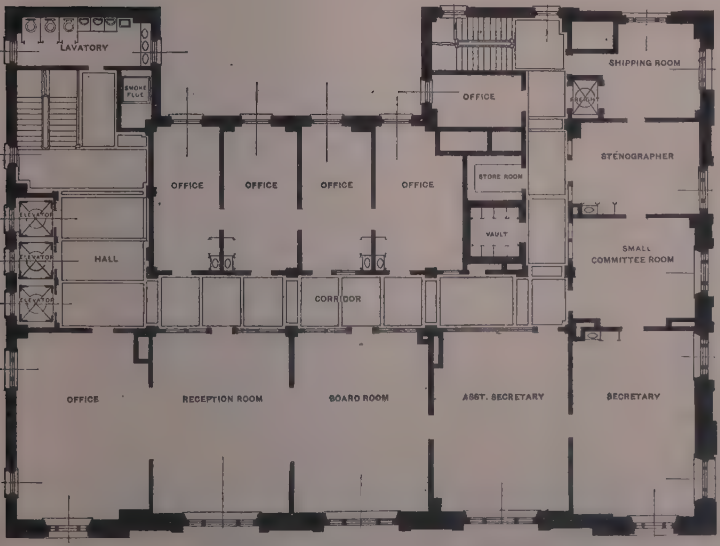
Plan of Auditorium or Third Floor



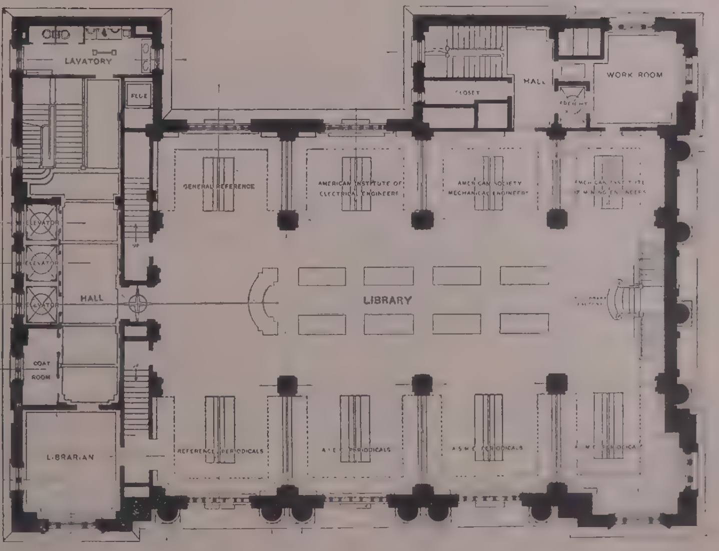
Plan of Assembly or Fifth Floor.



Plan of Lecture Hall or Sixth Floor.



Plan of Am. Inst. E. E. Offices, Tenth Floor.



Plan of Library or Thirteenth Floor.

TYPICAL FLOOR PLANS OF UNION ENGINEERING BUILDING, NEW YORK.

free from dust. The floor below the library reading rooms will be devoted to the book stacks, although when first the societies enter the building, the alcove construction in the reading and reference rooms will take care of the nucleus of the future library which the societies will bring with them. This will leave the book stack floor for growth, as the library shall increase in size hereafter. It is believed that, by the co-operation of the New York Public Library on the adjoining block, and with the interest and strength which the societies will furnish, the library in the Engineering Building can be made the most important engineering library in the country. The committee has tried to provide ample space to accomplish this end.

The building is also to furnish office accommodations for a large and continually increasing number of societies which have engineering or some other department of science as their principal object; such are, for example, the New York Electrical Society, the Society of Naval Architects and Marine Engineers, the Heating and Ventilating Engineers, the American Gas Light Association, the National Electric Light Association, the Society of Chemical Engineers, the Association of Edison Illuminating Companies, and many others. For these organizations the building will offer office areas of varying sizes, whose arrangements will be adjusted to the requirements of such participants as shall hereafter be made known. Such participants will have the use of the auditoriums of the desired size.

The building must also serve as a business office for the founder and associated societies. Attention is called to the driveway, whereby access is had on the street level and under cover to the freight elevator, both for boxes of books and for other merchandise moving inward and for mail-sacks moving outward. This driveway also serves for carriage access to the auditorium and passenger elevators. It gives facility for unloading by gravity to the coal pockets of the heating plant without handling. The general convenience of the building is also served by the receiving and shipping office at the rear, through which all goods in and out will be handled. There is also the bureau of information, at the right of the main entrance, where general questions can be answered, visitors directed, and some routine business transacted. This office will also be a suitaable location for the telephone exchange, the telegraph and sub-postoffice.

By a business arrangement formed under legal advice and forming part of the deed to the property to the east of the building, a restriction has been placed which prevents the erection on that lot of a building more than 60 ft. high. This restriction runs with the land and secures light and air for the building on its eastern front above the third floor. The westerly wall is built 10 ft. within the property line, so that openings for light and air should always be left on that side and on the rear, even if high buildings should be hereafter built on adjoining property to the west and the north. The committee contemplates finishing the building on all four sides and not merely on the south façade, in order that its monumental character may be seen and recognized from every point of view.

The contract for construction was signed in July, the excavation for the foundations was started at once, and the work of construction has now commenced, the steelwork for two of the floors being in place. The building will probably be completed in about a year.

An Electric Test Car has recently been completed for the University of Illinois which will permit investigation of the power required for different speeds and grades under service conditions.

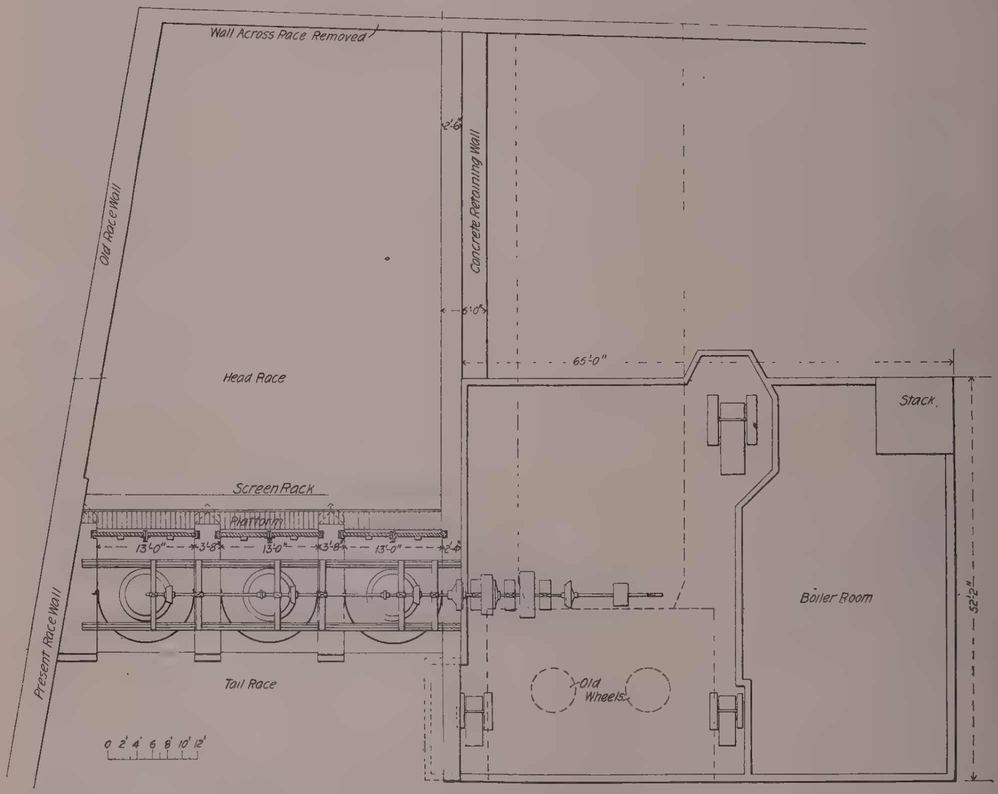
The Hydraulic Development of the Sterling Hydraulic Co.

The water power of the Rock River at Rock Falls and Sterling, Ill., is developed by a rock-filled, timber-crib dam, 940 ft. in length between abutments and 7.5 to 8 ft. high above the limestone bed of the stream. The dam is owned and controlled by the Sterling Hydraulic Co., and supplies water to twelve hydraulic power plants, with a total rated capacity of 3,311 h.-p. A race extends downstream on each side of the river from the abutments of the dam, and approximately parallel to the flow of the stream. Five of the power plants are along the race on the Sterling side of the river and the remainder on the Rock Falls side. The average head utilized by these plants is about 8 ft., but some slight changes would make a theoretical head of fully 8.8 ft. available.

The river has a watershed of 8,900 square miles above the dam. Its extreme minimum flow at the latter is 600 cu. ft. per second, while the ordinary low-water flow is 900 cu. ft. per second and the average low-water flow between 1,200 and 1,500 cu. ft. per second. There are some months at a time, however, when the normal flow is 2,000 to 2,500 cu. ft. per second. In a report on the water power available at the dam, made about two years ago, Prof. Daniel W. Mead, of Chicago, recommended that, with a suitable auxiliary steam plant, a hydraulic power to the full capacity of at least 2,000 cu. ft. per second would be an economical installation. Much of the time during the year the hydraulic plants can be and are fully utilized. This percentage of time is so large that the power of the river could certainly be used to a greater extent than at present. Auxiliary steam power would be necessary during low water for a comparatively brief period only. The auxiliary steam power now installed in connection with the water power is about 6,000 h.-p., but of this total, 4,600 h.-p. is in a mill of Dillon-Griswold Wire Co., which has but 1,750 h.-p. of water wheels installed.

Most of the manufacturing establishments at Sterling and Rock Falls are operated for 10 hours a day only. Unless storage or pondage is provided to impound the water during the time when the wheels are idle, the flow of water during the night is lost. With 18-in. flashboards on the dam a storage of about 42,000,000 cu. ft. can now be provided. In order to make a flow of 2,000 cu. ft. a second for the entire 24 hours available during a 10-hour period, a storage of about 100,000,000 cu. ft. of water would be required. While such a storage is not available under the present conditions, it could be made available by a greater height of dam without flooding any comparatively large amount of land. The impounding of 2,000 cu. ft. per second during the 14 hours while the wheels are idle would admit of the development of 4,800 h.-p. during a 10-hour working day. A still greater storage could be obtained, and would be of considerable advantage, as it would aid in equalizing the variation in low-water flow, due to the closing down of hydraulic plants on the river above Sterling over Sunday. This influence becomes very noticeable during extreme low water, when stopping the wheels of these factories practically stops the flow of the river for several hours at each dam, and affects the flow further downstream a day or more later.

The generating station of the National Gas & Water Co., at Sterling, is somewhat typical of those dependent on the flow of the river for power. It is built at the lower end of the race on the Sterling side of the river, and consists of a one-story brick building, 52 x 65 ft. in plan, in which electric current is generated and then distributed for power and lighting in Sterling. The mechanical equipment of the station originally embraced two 72-in. turbine water wheels, made by the Stilwell-Bierce Co., with a combined rated capacity of 180 h.-p. under the available head of 8.55 ft. A steam plant consisting of three engines, with a total capacity of 360 h.-p., and 3 boilers was also installed. This combined power arrangement drove 4 Westinghouse generating units, with a combined capacity of 185 kw., the wheels, engines and generators being in



Plan of the National Gas & Water Company's Plant one large machinery room. Three 50-in. vertical turbines, with a total capacity of 342 h.-p., made by James Leffel & Co., have recently been installed, and the electric generating capacity of the plant increased by the addition of a 100-kw. and a 200-kw. Westinghouse generator.

The station is at the point where the race from the dam makes nearly a right-angled turn to join the river again. The side of the building is parallel to the main part of the race, and the end of it parallel to the latter after it turns toward the river. Water is supplied to the 72-in. wheels through a branch race, 22 ft. wide and 100 ft. long, which connects with the main race just above the turn and extends transversely under the station building. The three new wheels are in separate penstocks made of concrete, steel plates and structural steel shapes, and are in a newly constructed race at the end of the building next to the main race. A heavy stone masonry wall separated the end and side of the building about 50 ft. from the main race. A concrete wall, 2.5 ft. wide on top, 18.5 ft. high, and 102 ft. long, was first built along the end of the building and parallel to it from the downstream corner of the building to the old masonry wall along the race and parallel to the side of the building. The portion of the old wall outside the concrete wall was then removed down to the building line and a part of the flow diverted through the branch race formed between the two walls.

Construction View from Downstream Side of Bulkheads for New Turbines.

The branch race has a width of 51 ft. at the wheel centers, and at that point is divided in three equal parts by two concrete piers built parallel to the flow in the race. These piers are 3 ft. 8 in. thick, 19 ft. long and 27 ft. 9 in. high. They and the walls of the race form the side of the penstocks of the turbines. The upstream end of each penstock is formed by two vertical gates which control the flow through it, while the downstream end is formed by ¼-in. steel plates bent to a half circle. The half-cylindrical steel-plate sections are 12 ft. high. They are fastened to the concrete in the sides of the penstocks by bolts and riveted at the bottom to an angle bent in a half circle and imbedded and anchored in the concrete of the penstock floor. Each turbine is carried on the concrete floor of its penstock. The floor is supported about 2 ft. from both its upstream and downstream sides by two 15-in. transverse I-beams, with their ends imbedded in the concrete piers or the walls of the race. Each pair of I-beams also rests at the center of the 13-ft. span between the sides of the penstock on a 9-in. cast-iron post, which stands on a concrete footing built in the solid rock forming the bottom of the wheelpit. An 8-in. I-beam, supported the same as those in the pairs, is placed in the downstream edge of each penstock floor to carry the weight of the water above that part of the floor. The concrete between the various beams and between them and the side walls of the penstock is arched and reinforced.

An inclined screen rack, resting at the bottom on an angle imbedded in the concrete footing of the piers, is provided on the upstream side of the penstocks. It is held upright by horizontal I-beams, supported on bearing plates on the breakwaters of the piers and with their ends imbedded in the concrete of the race walls. The two sluice gates which control each penstock each span half the space between the sides of the latter. A vertical I-beam at the center and channels and plates in the concrete of the piers form the guides for these gates. Their stems are fitted with racks, and they are raised and lowered by pinion gear wheels on an operating floor at the level of the top of the piers.

Each turbine is connected by a vertical shaft through a gearing above the operating floor to a horizontal line shaft which extends into the station building. The turbines are controlled by Woodward governors on the operating floor. This floor is carried by two pairs of 15-in. I-beams, arranged about the same as those carrying the penstock floor. The shafting and its bearings are carried by cast-iron knee braces which rest on the pairs of transverse I-beams, and on the concrete piers. The gearing is carried by the floor, which has two cross-beams under it placed similar to those under the turbines in the penstock floor. A frame gate house, which has a galvanized sheet-iron roof and is connected with the station building, extends over the penstocks, enclosing the gearing, line shaft and gate hoists.

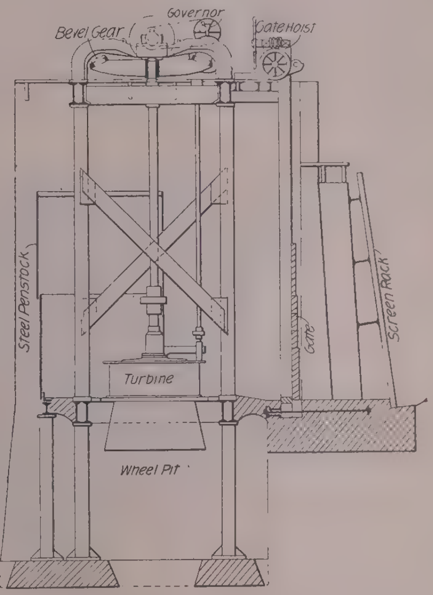
The decks of the turbines are 9.25 ft. above the bottom of the wheelpit. They could have been set lower, but during certain stages of the river, which last for considerable periods, the level of the water in the tailrace rises nearly to the level at which they now stand.

The power station is owned and operated by the National Gas & Water Co., of Chicago. Prof. Daniel W. Mead, of Chicago, was consulting and supervising engineer for the company during the reconstruction of the station.

The Pike's Peak Hydro-Electric Company's Water Wheels.

One of the most interesting electric transmission plants in the West is located at Manitou, Colo., at the base of the Pike's Peak Range. The installation is of striking design on the hydraulic side, as the effective head of water available at the wheels is 2,100 ft., which is one of the highest utilized falls in the world. The plant is owned by the Pike's Peak Hydro-Electric Co., and the machinery is installed in a 45x85-ft. brick and reinforced concrete power house, located near the bottom of the ravine which marks the beginning of the Cog Road journey up the peak. The pipe line is of steel, about 9 miles long, water being drawn from the region of Lake Moraine to the plant at Manitou through some of the roughest passes to be found in the Rockies. Enormous difficulties have attended the handling of the heavy steel pipe from the inception of the work, hoisting engines, motors and tramways having been employed to transport the material up the mountain sides inch by inch at a time.

The power house was designed to accommodate four 750-kw. generating units. These units comprise the first installation and each consists of a General Electric 16-pole, 750-kw. three-phase, 25-cycle, 6,600-volt alternator, direct-connected to an 88-in. Pelton water wheel, having a normal speed 450 r.p.m. The generators are of the revolving field type and the object of the plant is to supply current for lighting and power service in Colorado Springs, about 5 miles away. The village of Manitou is also included in the load scheme, together with such lamps and motors in Colorado City as it may be expedient to supply.



Elevation of a Bulkhead and Turbine.

The wheels were built by the Pelton Water Wheel Co. of San Francisco. Each is designed for an overload capacity of 50 per cent., giving a maximum output of 1,500 h.-p. From the hydraulic standpoint the arrangement is simple, as the wheel is mounted directly on the generator shaft between the bearings. The shaft is 30 in. in diameter at the wheel fit. The wheel center is of the highest grade of rolled flange steel, machined all over and fitted to a cast flanged hub secured by turned steel bolts. There are 30 buckets on each wheel of gun metal equal to the U. S Naval requirements. The buckets are divided at the center by sharpened splitters, and the cavities are fine ground to true surfaces and polished The lugs on the buckets are milled out to a driving fit of the center which they straddle and each bucket is secured by two 1-in. turned steel bolts driven in reamed holes. The buckets are independently weighed and balanced, and centered on the disc so that the cutting wedges are in the same central plane. Before shipment the complete wheel was carefully tested for alignment and soundness and balanced for the correct running speed.

Each wheel is enclosed by a sheet steel cover housing made of marine steel plates thoroughly braced to prevent vibration. The housing is close riveted, chipped and caulked for water tightness.

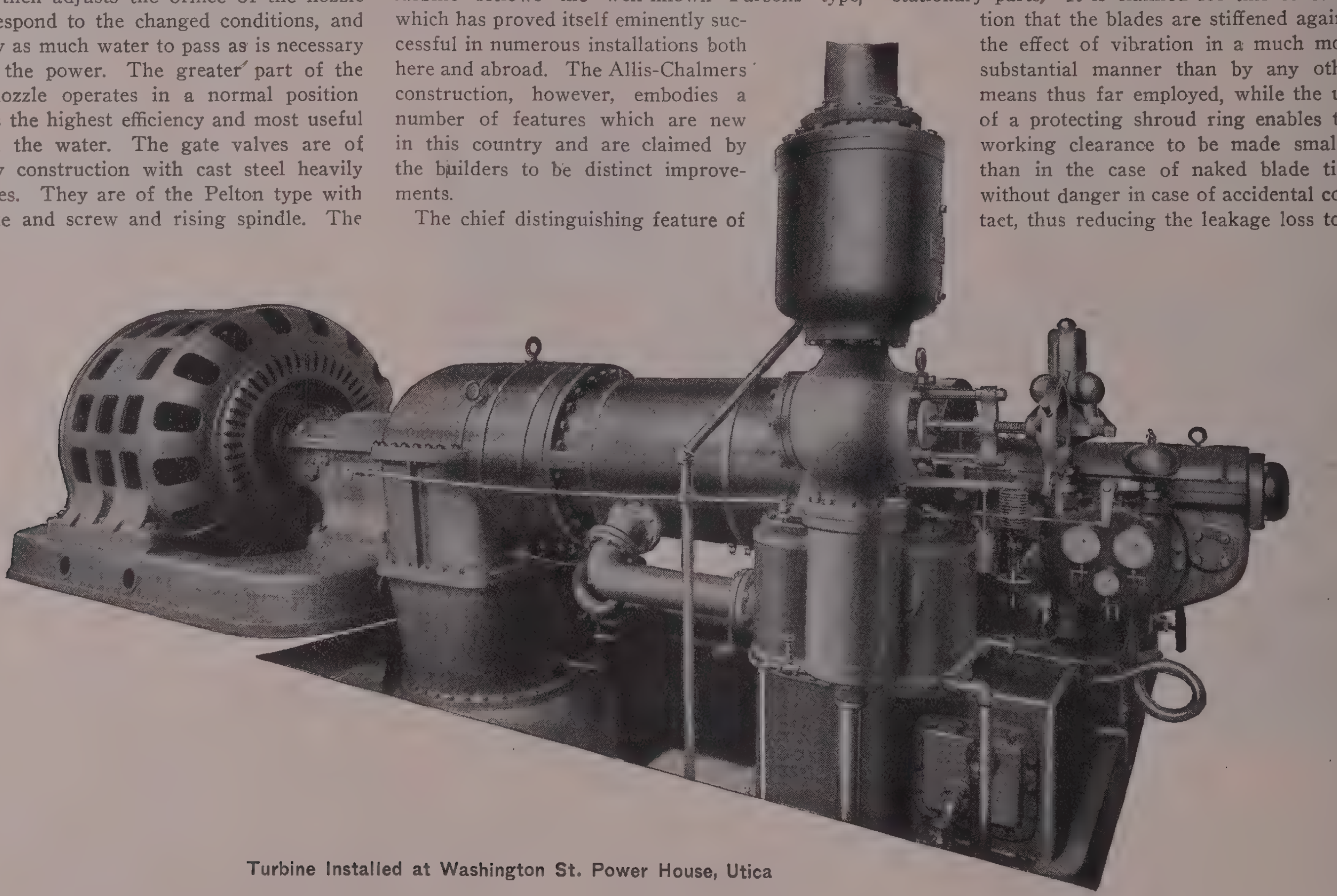
The nozzle of each wheel is of the combination needle and deflecting type, constructed of cast steel. It consists of a ball and socket deflecting nozzle with which is incorporated a needle nozzle working in a gun metal lined tip. The deflecting portion of the nozzle is controlled by an automatic governor which raises or lowers the stream of water as the load is increased or diminished; the needle then adjusts the orifice of the nozzle tip to correspond to the changed conditions, and enables only as much water to pass as is necessary to develop the power. The greater part of the time the nozzle operates in a normal position which gives the highest efficiency and most useful effect from the water. The gate valves are of extra heavy construction with cast steel heavily ribbed bodies. They are of the Pelton type with outside yoke and screw and rising spindle. The valve seats are of gun metal and the stems of nickel steel. The gates are geared and provided with electric motors so that they may be operated from the switchboard. The gates are also equipped with by-passes. All the connecting pipes, gates, nozzles, etc., are of cast steel heavily ribbed and over 1½ in. in thickness.

The main pipe line of riveted steel is 21 in. in diameter at the power house and the branches to each wheel are 6 in. in diameter. It was supplied by the Power & Mining Machinery Co. of Cudahy, Wis. The greatest care was necessary in the construction of every part of the hydraulic equipment on account of the unusual head employed. At this head the pressure is 913 lb. per square inch, and the stream issues from the nozzle at a speed of 250 miles per hour.

THE STARTING OF GAS ENGINES in cold weather is facilitated by heating the cylinder, or the air inlet passages, by a blow torch, which assists in the formation of the combustible mixture necessary for the first explosion.

The Allis-Chalmers Steam Turbine.

The recent starting up of a steam turbine at the Washington St. power house of the Utica Gas & Electric Co., Utica, N. Y., calls attention to the fact that this is the first turbine to be put into operation by the Allis-Chalmers Co., who have recently entered the steam turbine field. The turbine outfit installed at Utica is shown in the accompanying illustrations. It is rated at 1,500 kw. normal load, and runs at a speed of 1,800 r.p.m. It is direct coupled to an Allis-Chalmers two-phase, 60-cycle revolving field alternator, operating at 2,500 volts. The unit has a continuous overload capacity of 25 per cent., with a three-hour 50 per cent. overload capacity without exceeding a safe generator temperature, and capable of a 100 per cent. safe momentary overload. Artificial ventilation by means of an electrically driven fan blower will, however, enable the unit to be run safely beyond its rated overload capacity. The turbine follows the well-known Parsons type, which has proved itself eminently successful in numerous installations both here and abroad. The Allis-Chalmers construction, however, embodies a number of features which are new in this country and are claimed by the builders to be distinct improvements.



Turbine Installed at Washington St. Power House, Utica

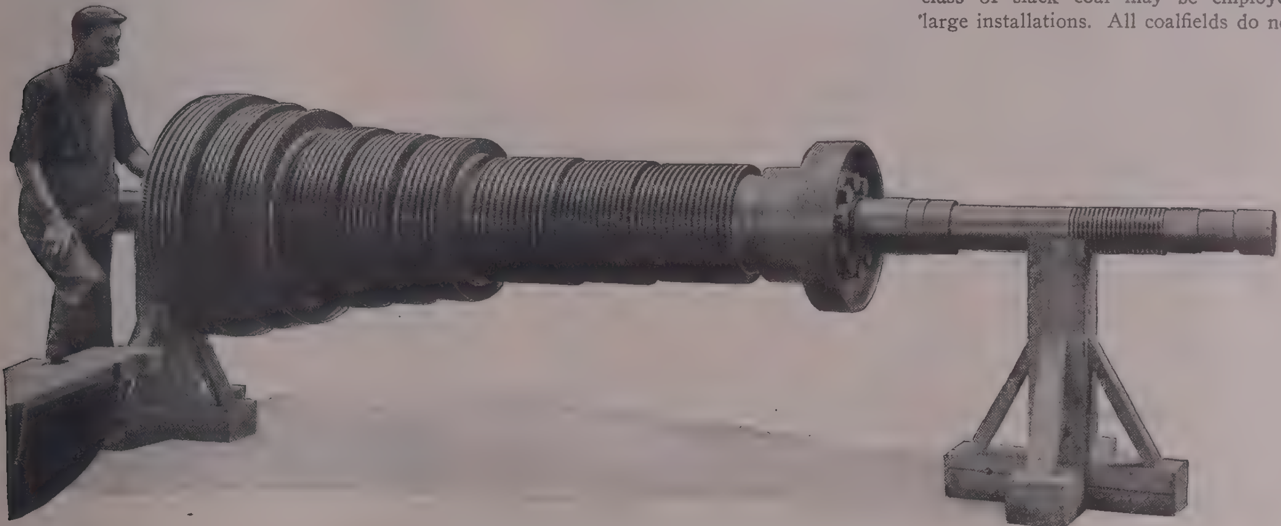
The chief distinguishing feature of this construction is the blading, which, while it is of the Parsons reaction type as regards the principle of operation, differs in mechanical construction in a number of essential details. The roots of the blades are formed in dovetail shape by special machinery, and are inserted in slots cut in foundation or base rings, these slots being formed by special machine tools in such a way as to exactly conform to the shapes of the blade roots. The foundation rings themselves are of dovetail shape in cross-section and are inserted in dovetailed grooves cut in the turbine cylinder and spindle respectively, in which they are firmly held by key pieces, much in the same way that the well-known "Lewis bolt" is fastened. In order to further ensure the integrity of the construction, the key pieces or rings after being driven into place are upset into undercut grooves.

Another noticeable feature of the blading is the method of reinforcing and protecting the tips of the blades. This point in steam turbine design is one upon which much thought has been expended by various inventors, and the Allis-Chalmers Co. claim that the construction employed by them successfully solves the difficulties. In forming the blades a shouldered projection is left at the tip. This is inserted in a slot punched in a shroud ring, the slots being punched by special machinery in such a way as to produce accurate spacing and at the same time form the slots so that they will give the proper angles to the blades, independent of the slots in the base ring. After the blade tips are inserted in the slots in the shroud rings they are riveted over by specially arranged pneumatic machinery.

The shroud rings are made in channel shape, with outwardly projecting flanges which, after assembly in the turbine, are turned and bored to give the necessary working clearance. The flanges of the channels are made so thin that, although amply sufficient for stiffness, the shroud ring does not have the disadvantage of a solid shroud which acquires a dangerous temperature by friction in case of an accidental contact of the rotating and stationary parts. It is claimed for this construction that the blades are stiffened against the effect of vibration in a much more substantial manner than by any other means thus far employed, while the use of a protecting shroud ring enables the working clearance to be made smaller than in the case of naked blade tips, without danger in case of accidental contact, thus reducing the leakage loss to a minimum, the leakage past the blade tips being the principal source of loss in the steam turbine. As to the safety from damage in case of accidental contact, it is claimed that this has been proved by experiment with actual blading, by throwing the bearings out of center so as to produce contact, without detrimental results. An incidental advantage claimed for this construction is that if by chance a blade should prove defective, it is so held in place by the shroud ring that it cannot work loose and produce damage.

By the method of construction described, the entire blading is produced by machinery, thus eliminating the personal equation which enters into blading done by hand work, which depends upon the skill of the individual workmen. Besides ensuring that every blade is securely fastened, all blades are necessarily set at exactly the designed angle and pitch; the openings between blades, upon which in great part the economical performance depends, being absolutely uniform. The blading is made up in half rings in the blading shop and is inspected before being inserted in the turbine.

Another special feature of this turbine, the absence of the usual low-pressure balance piston, is evident from the illustration of a turbine spindle. This shows only two balance pistons instead of the three pistons formerly used in this type of turbine, where it is said to have been found difficult to produce a balance piston of the size required for balancing the low-pressure stage of the turbine and at the same time make it sufficiently rigid to run with the necessary small working clearance. In the Allis-Chalmers construction there is, however, a third balance piston, but instead of being at the high pressure end of the turbine, as formerly arranged, it is at the low pressure end, and as it is smaller than the large end of the spindle it is hidden from sight in the photograph. By making this piston in such a way that its circular area is equal to the annular area of the pistons used in the older construction, the low-pressure balance piston is made much smaller. Instead of reducing the leakage past this piston by means of "dummy packing," as in the high-pressure and intermediate pistons, and as used in the low-pressure pistons of the older construction, a labyrinth packing of radial baffling type has been adopted, thus eliminating small axial clearance in this turbine. A considerable advantage is claimed for this construction in permitting of the use of smaller working clearances in the high-pressure and intermediate balance pistons.


Turbine Spindle of Same Size as That of Utica Unit.

The alternating current generator of the Utica outfit is deserving of more description than the present article will allow. Perhaps the most noticeable feature of this generator is the substantial design of the revolving field, providing great strength and at the same time giving the thorough ventilation which is essential. Particular attention has been paid to the insulation, as may be inferred from the fact that the armature was subjected to an alternating current insulation test of 10,000 volts for the period of fifteen minutes. This generator was built at the Bullock Works of the Allis-Chalmers Co., at Cincinnati, where the generators for all of their other turbine outfits are being built.

The Allis-Chalmers Co., in entering the steam turbine field, effected an alliance with the Turbine Advisory Syndicate of England, thereby securing the cooperation of the firms therein interested, including Messrs. Willans & Robinson, Yarrow & Co., and the Neptune Shipbuilding Works. The Utica turbine, in fact, was built for the Allis-Chalmers Co. by Messrs. Willans & Robinson, to whom a number of turbine contracts were sub-let by the Allis-Chalmers Co. before the latter had perfected the installation of their special machinery for turbine manufacture. An agreement has more recently been effected with Hon. Charles A. Parsons, C. B., for interchange of data, thereby giving to the Allis-Chalmers Co. the benefit of the vast experience of Mr. Parsons, the original inventor of this type of turbine, and to whose engineering ability and indomitable energy the evolution and present state of perfection of the successful steam turbine are principally due. The Allis-Chalmers Co. have also secured rights under Mr. Parsons' patents for marine turbines and turbo-compressors and blowers, for which there is a growing demand.

At present the Allis-Chalmers Co. are building their steam turbines in their engine works at West Allis. The growth of the business, however, has led to a large extension of the works, amounting to a practical doubling of the present plant. A considerable part of the extension will be devoted to the manufacture of steam turbines and the accompanying electric generators, one of the three new manufacturing buildings being given up to the exclusive manufacture of the turbines themselves. The first steam turbine of the Allis-Chalmers Co.'s own make, of 5,500 kw. capacity, has recently been shipped, and others are following as fast as the present crowded condition of the shops will permit.

A Peculiar Air Lift.

A peculiar air lift has recently been installed at the sewage disposal works at Worcester, England. The sewage flows into a circular well 20 ft. in diameter with a conical bottom, in which the street dirt settles. It was originally intended to lift this sludge by a bucket elevator, but an air lift was finally installed. The discharge pipe is 6 in. in diameter and is enclosed by a larger pipe with a number of small quarter-bend pipes pointing downward attached to its lower part. Compressed air is discharged just below the entrance to the discharge pipe from a pipe carried down the side of the well. When the air is passed through the apparatus, the sewage in the well enters the space between the two pipes through slits in the upper part of the casing, passes down this confined space to the bottom of the discharge pipe and then rises through the latter to the outlet. Part of the sewage emerges from the casing through the quarter-bends and stirs up the sludge in the conical bottom of the well by the currents produced in this way. This apparatus is stated in the "Surveyor" to work satisfactorily in removing the grit and small stones that enter the sewerage system from the street surfaces.

Notes on Producer Gas for Power.

Some months ago Mr. Ernest A. Dowson read a paper before the Birmingham Association of Mechanical Engineers on the use of gas for power and heating, in the course of which he stated that for power gas the best British results have been obtained when the fuel is either small anthracite peas or ordinary gas coke, but latterly something has been done in the way of using ordinary hard, non-caking, bituminous coals, which in some districts are cheaper than the former. It must, however, be remembered that a mere comparison of the prices of the raw fuels per ton does not constitute a complete basis from which to compute the relative costs of a brake horse-power-hour obtained in any given cases. Fuels other than the two first mentioned have certain drawbacks, especially in plants of average size. The removal of the tar which is found in gas made from any bituminous fuel requires more extensive cleaning apparatus, part of which generally needs engine power to drive it, while the water consumption is increased for the same reason, in addition to which it is distinctly a dirty process. It is a mistake to suppose that any class of slack coal may be employed, even in large installations. All coalfields do not yield fuel which will give good results in gas making. Bituminous coals are not of so uniform a quality as are those of the anthracite class, and they will always be more troublesome to deal with than are the latter. Some coals are very apt to "hang up" in the generators, which, besides causing troubles in working, inevitably leads to variations in the quality of the gas made. More labor is always involved in the gasification of bituminous fuels, and a certain element of risk is introduced of tar getting over to the engines on occasion. When this occurs much trouble is experienced by the "gumming up" of the valves and other working parts, causing serious delay and loss.

Various devices may be adopted for lessening the deposition of this tar. One of these consists in splitting up the tarry vapor into its volatile constituents by passing it through the hottest zone of the fire. This principle may be applied by working the generator downward, an example of which is seen in the "inverted" generator of M. Deschamps. Another method is to by-pass the raw gases and circulate them through the whole depth of the fire before letting them go forward. Some ten years since this process was applied in tests by the Dowson Company, and it has certain advantages where such fuel is used. All these arrangements are, however, somewhat complicated, which is an inadvisable feature in an ordinary factory plant. It is a fact that small and medium-sized installations working with bituminous coal have been found to cause a great deal of trouble, and probably it is wise to look on this fuel as hardly suitable for such cases.

Two Half Rings of Blades Ready for Assembly in Turbine of Size of Utica Unit.

Provided one has sufficient scrubbers and washers there is no obstacle to the use of such bituminous fuel, however, and a notable instance of this is to be seen in the large plants arranged by Dr. Mond. The latter has also designed a very ingenious system for the recovery of sulphate of ammonia as a by-product. This is effected mainly by working at a specially low temperature, and subsequently washing the gas with a stream of dilute sulphuric acid. For working on a very large scale this system has shown good results, but it is hardly applicable to the case of the average user, and it is necessary to select a fuel containing a fair percentage of nitrogen. It should be remembered that not only is it advisable that any power plant should occupy as small a space as possible, but that its parts shall be free from complications, which inevitably call for skilled attention and increase the risk of stoppage. Members of this association are aware that a large central supply station has been erected at Dudley Port for the distribution of gas made on Dr. Mond's system, and the working results will be awaited with much interest. Apart from the recovery of ammonia, the actual process of gas making in this plant is similar to that employed in other systems. The heating value of the gas from these "recovery" plants is about 150 B.t.u. per cubic foot.

Many engineers have thought that the power obtained from an engine working with gas plant of the suction type would be much less than if the gas were supplied under pressure. This, however, is not the case, as an inspection of a batch of indicator cards taken from engines of various makes, the sizes varying from 30 h.p. to 100 h.p., shows in each case a mean pressure of from 80 to 90 lb. per sq. in. In discussing the point with users of these plants, Mr. Dowson has often changed the engine over from the normal working under pressure to working by suction alone, without easing the load, notwithstanding which no change was noticed by those in charge. On this system it is not always essential that each gas engine shall have a separate plant. Provided they are fairly close together, two or more engines may be coupled up to the same generator. It is, of course, necessary to consider their relative locations, and to design the connecting main services with care. This suction type of plant has been erected in conjunction with various makes of engines, both at home and abroad, to the extent of over 10,000 h.p., apart from any of those now supplied by Continental and other makers. For moderate powers, say from 10 h.p. to 300 h.p., where no exceptional requirements have to be met, it offers many advantages.

The fuel consumption is extremely low, as instanced by tests which have shown a figure as low as 0.8 lb. per brake h.p. per hour of small anthracite of commercial quality, such as can be obtained in Birmingham at about 18s. per ton. The water required for gas making and cooling does not exceed about 6 pints per hourly brake h.p. Beyond this an allowance for attendance must be made, and for a plant of, say, 100 brake h.p., the time required is about 2 hours daily for one man. The small space occupied is also an important feature, and this is, roughly, equal to about half a square foot for each brake horsepower capacity. Installations of this type of plant are at work where the power is utilized in driving dynamos, supplying current for both electric lighting and power, and the fact that the whole station costs have worked out at from ½d. to ¾d. per unit shows the really remarkable economy of the system.

For special cases, and where gas is required to serve the double purpose of driving engines as well as for carrying out heating processes on a moderate scale, an apparatus of what may be called a "combined" type is often used. On this system a portion of the gas is passed into a small gasholder to supply the blowpipes or burners, while the rest is sucked away direct to the engines. This arrangement economizes space and has other features to recommend it where various kinds of work are carried on.

The particular type of gas making plant to adopt in any given case can only be decided upon after a careful review of the special conditions under which it will work. There are usually quite a number of these conditions, each of which has an important bearing on success of the scheme.

Welding Copper has long been a deeply desired but seemingly impracticable operation. Mr. Stephen S. Baird, a blacksmith of Chittenden, Vt., near Rutland, writes that he has perfected a process for doing the work quickly and cheaply.

Mechanical Lift Locks in America.

Extracts from a paper submitted to the Tenth International Navigation Congress by Lieut.-Col. Thomas W. Symons, Corps of Engineers, U. S. A.

Before New York State finally committed itself to the enlargement of its canals, a survey with plans and estimates of the cost of the work was required. In the making of these plans and estimates a great deal of consideration was given to the subject of high mechanical lift locks, particularly at two places on the Erie Canal, Lockport and Cohoes.

At Lockport there is an abrupt change of elevation in the present Erie Canal of 56 ft. which is overcome by a double flight of five locks. The proposition considered here for the enlarged canal was to substitute a single mechanical lift lock for the present ten locks.

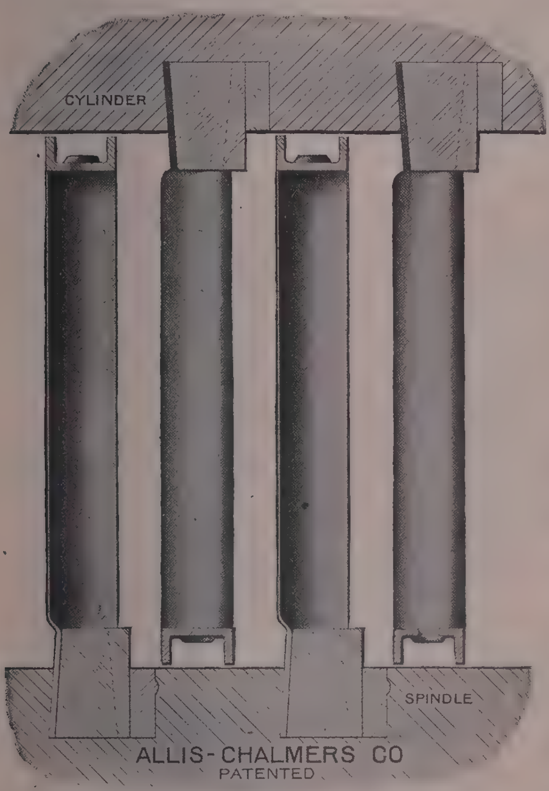
On the existing canal at Cohoes there are 16 locks to overcome the difference of level between the Hudson and the Mohawk above Cohoes Falls. These locks, known as the "The Sixteens," are quite near together but are separated by lengths of canal forming basins. Here it was proposed to make a change of location and put in a single lift lock with a lift of 112 to 121 ft., the variation depending on the height of the dam to be built above the Cohoes Falls.

It was claimed by the advocates of mechanical lift locks at both these places that they would be cheaper to build and to operate than locks of the ordinary type, that it would take less time for the passage of boats and would require very much less water. As water for power at both points is valuable for manufacturing purposes this latter claim was important.

So important was the subject of locks at these two places that the State Engineer of New York, at that time Mr. E. A. Bond, appointed a special board of engineers to consider it. The writer was a member of the board. This board directed its attention particularly to the lift at Cohoes because at this point there is the greatest and most abrupt change of level in the whole line of canal and therefore the most favorable site for using a mechanical lift lock. At the time that the board met the change of level proposed for the lift was 112 ft. The locks prescribed for the improved canals were, in the clear, 310 ft. long, 28 ft. wide and with 12 ft. depth of water.

To accomplish the required lift of 112 ft. with a single structure three kinds of mechanical locks were suggested. The central principle of them all consisted in the counterbalancing one against the other of two tanks of the size above given for locks, each tank capable of containing and floating two boats of 1,000 tons freight capacity, with auxiliary devices to control their vertical motions through the prescribed amplitude of the lift.

Besides this primary function of vertical movement in unison between the two levels, the three kinds of lifts each provided devices and apparatus for closing and opening communication between the tanks and the upper and lower levels, for keeping the tanks constantly horizontal and for bringing them to rest without shock. Although each typical plan presented its own details for these appliances, the closing and connecting details in the nature of gates and gaskets did not in any way belong necessarily to the type, but any one of them could be applied to any type of lift lock.



Method of Fastening Blades and Shroud Rings.

Appearance of Assembled Blades, Allis-Chalmers Steam Turbine.

The three types differed essentially in the medium through which the balancing was effected; in the first type the medium was air; in the second it was a set of cables; in the third it was water.

The air type examined was the Dutton pneumatic lift lock. In this design the counterbalance is effected by columns of compressed air confined in air chambers under each tank, inter-communicating at the bottom through air supply pipes which also communicate with an air accumulator and compressor. Each tank is supported on an inverted caisson which rises and falls in a fixed pool of water, which water seals the air in the caisson. These air chambers support the lock tanks by their buoyancy and displace a volume of water equal to their own weight together with that of the loaded tank, and to insure the water seal, they must be made so high that the bottom edge will remain submerged in the water of the lower pool to a depth greater than their displacement when the lock tank which they support and to which they are attached is raised to communicate with the upper level; this requires pits of a corresponding depth in the lower pool. As designed by the inventor, the air chambers and tanks have approximately the same horizontal area; giving for locks of the enlarged canal a vertical displacement of about 20 ft. and requiring pits about 140 ft. deep, for a lock of 112 ft. lift. These pits would have to be excavated about 325 ft. long and 35 ft. wide and kept free for the up and down movement of the tanks.

In the second type of lock examined by the Board the companion lock tanks were held in counterbalance by wire or chain cables passing over wheels or drums supported on steel towers. Mr. W. R. Davis submitted a carefully worked out plan and estimate for this type covering the Cohoes site.

Neither of these two types of locks, the pneumatic and the chain balancing, had reached the experimental stage, being simply preliminary studies on paper and the Board stated that though their design bore evidence of careful study, great labor, and the exercise of trained intelligence and ingenuity and indicated entire feasibility, it would hesitate to recommend a mechanical contrivance of this magnitude involving the harmonious working of so many functions, until its workable value had been ascertained by experiment and practical trial on a large scale. This the Board considered especially true of the pneumatic lock whose many novel devices required practical tests to determine their proper proportions and modes and rate of operation.

The comparative cost of constructing and installing locks of these two types at the Cohoes site appeared by the quantitative estimates submitted by their designers to be somewhat greater for the superstructure of the tower and cable lock, than for the superstructure of one of the pneumatic type, but the cost for the excavations and masonry for the latter would be very large, making the total probable cost considerably greater than for a lock of the former kind.

In the third or hydraulic type of lift lock for which sketch plans were submitted by Mr. T. E. Brown, Jr., chief engineer of the Otis Elevator Co., and consulting engineer for the Buffalo Engineering Co., the counterbalancing of the companion lock tanks was effected by columns of water contained in suitable hydraulic cylinders symmetrically disposed under the longitudinal axis of each tank, intercommunicating at their lower ends, which must be sunk deep enough below the surface of the lower level to provide the desired lift. Mr. Brown proposed to use three cylinders under each tank and to coordinate their movement by a heavy central counterweight directly connected with both ends of the tank by a detail under which the weight always acts to overcome any irregular distribution of load caused by the tendency of the water to flow to whichever end of the tank might be temporarily depressed below the other end.

As stated by the Board the hydraulic type has the merit of having passed the experimental stage, as a considerable number of lift locks based on this principle have been constructed and are in operation. Each tank, has, however, generally been carried on a single hydraulic cylinder. It was felt that a single cylinder would not be sufficient for the long tanks of the canal proposed, 310 feet in the clear.

The Board expressed the belief that the synchronous movement of the opposite ends of the lock tanks carried on several cylinders could be secured satisfactorily by the method suggested by Mr. Brown in general accord with the model which he submitted. In addition to the fact that the hydraulic type of lock has been successfully tried, it is cheaper to install than the pneumatic lock on account of the far less volume of excavation and masonry involved in its construction and is probably cheaper than any other kind of mechanical lift lock.

It was considered that in relative merit the different types of mechanical lift locks stood as follows: 1, The hydraulic lock; 2, the chain balance lock; 3, the pneumatic lock.

Consideration was also given by the Board to the applicability of a double flight of four masonry locks of the ordinary type to overcome the fall, each lock having a lift of 28 ft.

After carefully studying the matter and giving due weight to questions of first cost, and cost of operation and maintenance, to time of passage by the fleets of boats which will probably use the canal, the water supply and usage of water, and liability to serious accidents and delays, the Board recommended that masonry locks of the ordinary type be adopted.

This recommendation was largely based on the fact that the water supply is ample for the ordinary locks and the State has the first right to it for purposes of navigation, and because the mechanical lift lock is a metallic machine subject to the wear, depreciation and necessary renewals which always make a large annual charge against every such machine. Its successful operation involves a great number of appliances all requiring power and attendance. In the masonry locks these features are confined to the gates and valves with the appliances for moving them. There can be no doubt that the masonry locks would be more cheaply maintained and operated and suffer less depreciation, and that they would afford greater immunity from serious accidents than any lock of the mechanical type in which an accident may prove a disaster, possibly a disaster which would prevent the use of the canal for an entire season of navigation.

Since the report of the Board a new route has been found and decided upon for the chain of masonry locks which gives a basin at the head of each lock ample in size to permit the lockage water to be used without materially lowering the water in the basin, thus permitting the use of single locks instead of a double flight of locks costing much more.

The Board having exhaustively considered the subject of lift locks at Cohoes where there is the greatest change of level, stated that at no other points were there as good reasons for adopting mechanical lift locks as at Cohoes and that masonry locks should be adopted throughout the entire canal system. The economy of masonry locks as compared with mechanical ones of any type increases as the height of the lift to be overcome decreases for the reason that a large part of the cost of locks of the latter type is for structures, apparatus and machinery that must be the same whatever the amplitude of their lift may be.

In accordance with the report of the Board, masonry locks have been adopted exclusively for the new Erie, Oswego and Champlain canals under improvement by New York.

A rather remarkable lock has been proposed for the Erie Canal at Lockport which is receiving consideration. At this place under the adopted plans for the new canal there will be a fall of 50 ft., and the original plans called for a double tier of two locks each with 25 ft. lift. The new proposition is to use instead a single masonry lock of 50 ft. lift with the regular horizontal dimensions of all other locks. The upper gates for this lock would be the same as for ordinary locks, but the lower gates would be entirely different. The head room under the fixed bridges of the canals will be 16 ft.; therefore the movable part of the lower gate need only be in height 16 ft. plus the depth of the canal, 12 ft., or 28 ft. in all. The upper 34 ft. at the lower end of the lock chamber may be fixed in position of steel or masonry. The gate proposed is a vertical lift gate which can be operated from the top of the fixed wall at the lower end of the lock chamber. When in position the gate would be very nearly square and supported on top and bottom and both sides. This lock will cost much less to install than the four locks originally proposed, but it has certain objections in the additional amount of water required for the passage of boats, the time required for lockage, and the difficulty of providing middle gates which render its adoption uncertain.

Repairing a Highway Arch Bridge.

A highway arch bridge of 150 ft. span which has recently behaved queerly has two main ribs of I-shaped cross-section, made continuous with solid-web longitudinal spandrel girders which virtually continue the arch-rib webs to a horizontal line just above the level of the heavily cambered roadway. Each rib was erected in three sections on trestle falsework, and when the last section was assembled on one side of the bridge, it was found that it was too long for the span between skewback seats. The 3-in. cast-iron bed plate at one end was therefore removed and the end section erected with contact on the masonry skewback bearing and between the upper corner of the longitudinal spandrel girder and the top of the abutment masonry. The wing walls are in the planes of the arch ribs and are surmounted at both ends by very heavy granite copings and massive blocks of granite like short shafts, weighing several tons each. Soon after the girder was seated the temperature rose considerably and the expansion of the arch rib displaced the wing wall coping which is about 14 in. thick, 30 in. wide and 25 ft. long with the heavy blocks seated on it at each end. The coping stones were bedded on the wing wall in cement mortar, but were not dowelled. They were moved longitudinally over ½ in. and were sprung upwards so as to form a flat arch with bearings at the ends only on the wing wall and a sufficient rise between the ends to show a continuous open crack above the top of the wall masonry. The joints between the ends of the coping stone were not displaced and the movement of the coping on the wall is noticeable only by a careful examination. The misfit girder was jacked up about 10 in. at the crown and clearance enough secured for the insertion of the missing bed plate. The jacks were then slacked off and the girder allowed to assume a new position with increased rise for the arch curve, but without contact with the upper part of the abutment wall.

Moving a Block of City Residences.

The extension about to be constructed for the Thirteenth Regiment Armory, in Brooklyn, N. Y., necessitates the removal of two rows of brick residences adjacent to it, between Jefferson and Putnam Avenues. It is said that these buildings were purchased with the intention of tearing them down and using their materials in rebuilding, but it has been decided instead to move them bodily to a new site on the opposite side of Jefferson Avenue. The work of removal was well advanced when recently visited, the first block being in transit, and the second was being prepared for moving. The work does not differ materially from other examples of moving and raising brick and stone buildings, but is of interest on account of the size of the buildings, their irregular construction and the thoroughness with which the preparations are made.

The block first moved is a row 90 ft. long of five three-story and basement brick buildings with stone fronts, which are of different styles and were built at different periods, so that there is little uniformity of construction. They are not only separate structures, but, being narrow, with thin walls, do not have great individual stability or rigidity, and, on account of their irregular rear extensions and combination of brick and stone walls, require very careful handling in order to avoid stresses likely to cause serious damage. Three of the houses are 45 ft. deep, one is 50 ft. deep and one is 55 ft. deep, and the estimated weight of the row is about 900 tons. They are built with thin double party walls which carry the transverse floor joists without intermediate supports. Some of the houses had porches which were removed before moving was commenced, otherwise the structures were not disturbed, and it is guaranteed under bond that they will not experience serious damage.

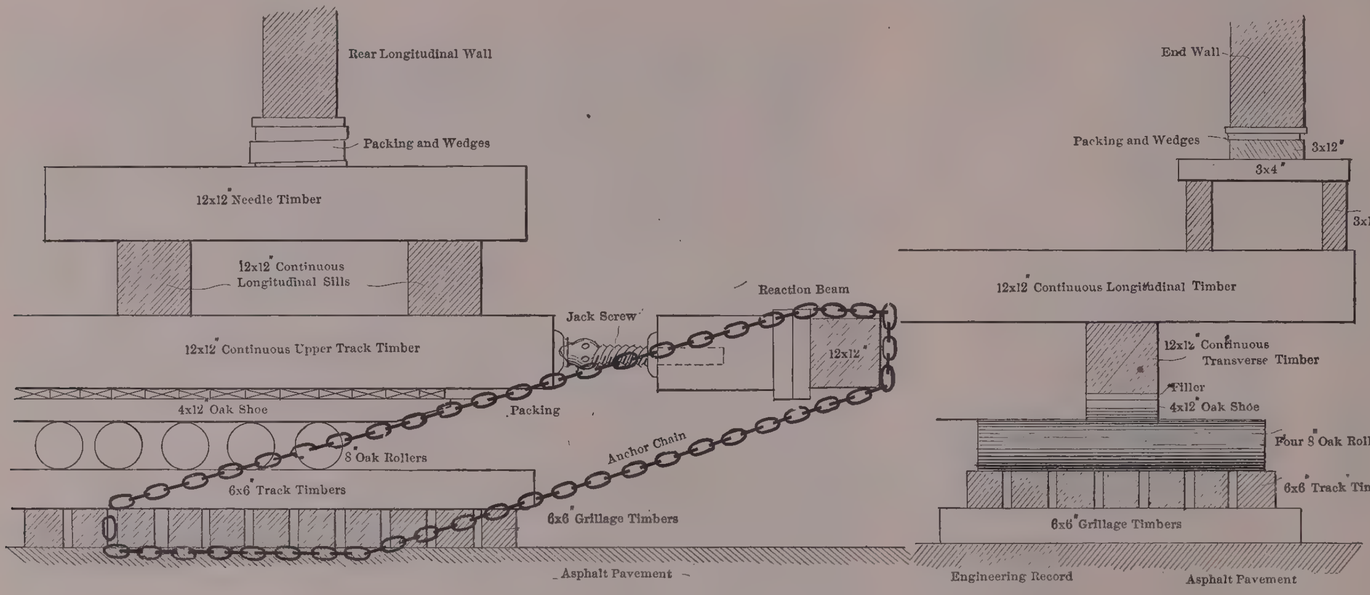


Diagram Showing Method of Moving a Block of Masonry Houses in Brooklyn.

Holes were cut through the end and intermediate cross walls and through them thirteen full length lines of 12x12-in. longitudinal timbers, and two short lines (under the deep houses) of longitudinal timbers were laid 2 or 3 ft. below the first floor. An additional line was laid outside the building close to the front and rear walls. All of them were made with timbers from 22 to 26 ft. long, resting on seven carefully levelled lines of 12x12-in. transverse timbers in convenient lengths, but jointed and spliced with fish planks spiked to the vertical sides.

Holes were cut in the front and rear walls and through them were passed 12x12-in. transverse timbers 10 to 14 ft. long, which were wedged up to support them from the outer pairs of longitudinal timbers. The party walls and the ends of the first floor joists were supported on transverse timbers on top of the longitudinal timbers, sometimes between the supports of the latter, and sometimes on their cantilever ends. In places where the brickwork was weak, it was continuously supported by thick planks wedged up from the beams or from cross strips laid on them. The end walls were carried on short, light longitudinal pieces close together supported at their ends, beyond the faces of the wall, on a pair of 2x10-in. transverse planks on edge 3 ft. apart, which were carried on the cantilever ends of the longitudinal timbers. Two lines of horizontal longitudinal struts about 15 ft. apart were set in the center of the buildings with their ends carefully fitted to butt against the sides of the transverse timbers, and the latter were tied together firmly by two longitudinal ¾-in. wire ropes stretched tight with turnbuckles, close to the struts. This formed a cradle which was X-braced by a pair of diagonal wire ropes. The row of houses were also tied together in the first story by four full-length ¾-in. longitudinal wire ropes with turnbuckle adjustments, which were secured to bearing timbers on the outside walls. The deepest house is at one end of the row and has a wide three-story bay window in front forming an extension which was secured by ¾-in. wire ropes passing transversely through in the second and third stories and tightened up by turnbuckles to clamp front and rear walls together with horizontal bearing timbers across the window openings.

The building was first raised 6 ft. in 5 days by twelve men operating 175 3-in. jack screws set on cribbing under the lower tier of transverse beams. Oak shoes about 8 ft. long made of 4x12-in. plank with bevelled ends were put under the transverse lower timbers at intervals of about 6 ft. in the clear and were wedged up to bearing with 1-in. shims and wedges between their upper faces and the timbers. Under each shoe four or five 8-in. oak rollers 4 ft. long were placed on tracks made of 6x6-in. timbers parallel to the transverse timbers and a lower layer of diagonal 6x6-in. pieces. The jack screws were slacked off and lowered the buildings to rest directly on the rollers.

Horizontal jack screws were placed against the rear ends of the seven lines of transverse lower timbers which formed the upper tracks of the rollers, and reacted against blocking and wedges bearing against a line of 12x12-in. longitudinal timbers about 5 ft. away which were chained to the lower track. Six additional jacks were set against the longitudinal timbers under the middle of the buildings and all being operated simultaneously the building was advanced at the rate of 20 ft. a day. When it reached the middle of the street the lower tracks were laid on the asphalt surface so as to cover it and distribute the load over the whole area occupied, and their direction was made diagonal to that of the upper tier. The rollers were then slightly cut with sledges and the jacks were operated so as to slowly revolve the buildings around a vertical axis. The jacks were operated at a signal given by a whistle, the one at the pivot end receiving only a single short stroke, the next one a longer stroke, the next two strokes and so on to the end, which received a maximum of one or two full turns, thus giving that end of the row a circumferential movement of 3 ft. to a corresponding movement of 2 in. at the opposite end. After the revolution was partly completed the pushing jacks were changed to the opposite side of the building and the operation continued until the buildings had been revolved 180 deg., when they resumed their forward movement until in line with their new foundations. Then they were moved longitudinally to the required position and lowered 6 ft. to place. The total rectilinear displacement of the buildings is about 300 ft. Great care has, of course, been taken to keep the buildings level and make all movements with great accuracy and uniformity, and no cracks have yet developed or any serious injury been sustained by the buildings. It is expected that they will require only minor repairs after being seated on their new foundations.

About 70,000 ft. of timber, B. M., and 200 rollers are used on this work which is being executed by Iversen & Gustavesen, contractors for moving and shoring.

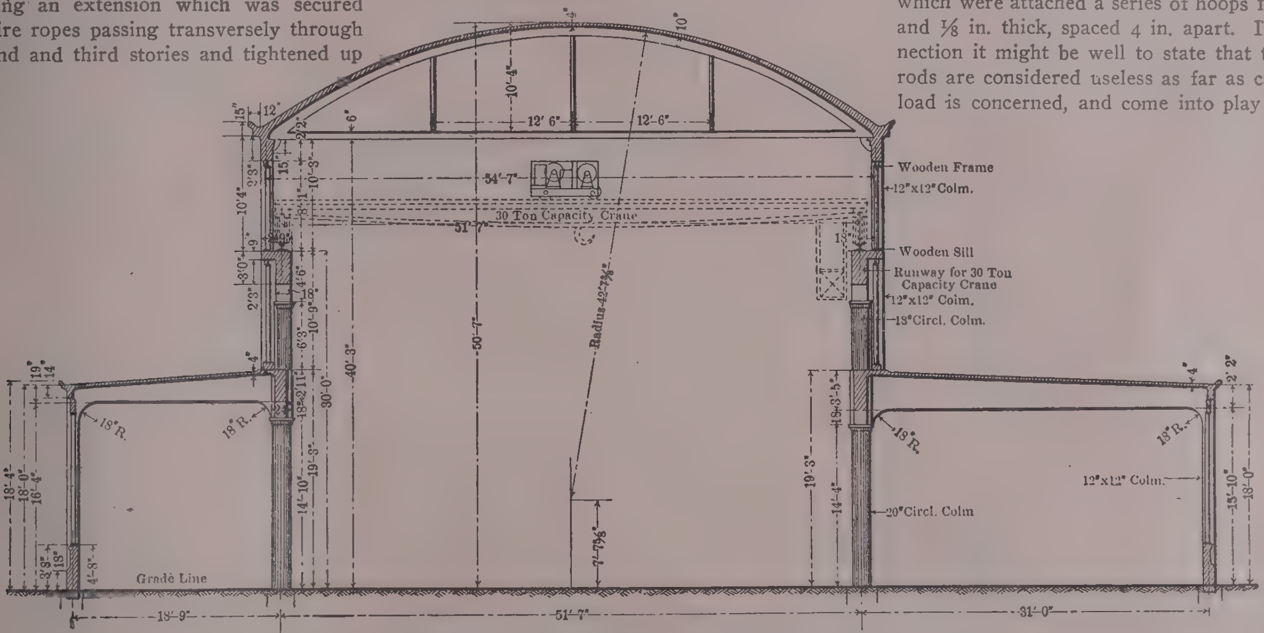
THE NAVAL CIVIL ENGINEERING EXPENDITURES during the year ending June 30, 1904, were $8,710,000, of which $7,152,000 was spent under specific Congressional appropriations. During the year three new dry docks were practically completed and great improvements made in the navy yards and stations, not the least being the consolidation of the various power plants in the yards, which is now under way. Six dry docks are now in various stages of construction, one of them being at Guantanamo, Cuba. In his annual report, Mr. M. T. Endicott, chief of the Bureau of Yards and Docks, strongly urges the necessity of making the service more attractive to competent engineers.

Reinforced Concrete Shop of Taylor-Wilson Mfg. Co.

An unusual system of reinforced concrete construction has been employed in the new shop of the Taylor-Wilson Mfg. Co., McKees Rocks, Pa. The structure was designed and built by Mr. Robert A. Cummings, and the construction was under the direct supervision of Mr. E. N. Hunting, who read a paper on it at the recent meeting of the American Society of Mechanical Engineers.

The shop is 160 ft. long and 102 ft. wide, and is carried on a series of foundation piers running down an average of 12 ft. to hardpan. These foundations were put in and a fill made around them. In the rear of the building which is on swampy ground, this fill was about 22 ft. In plan the shop consists of a center aisle 51 ft. 7 in. wide, and two leantos 18 ft. on one side and 30 ft. on the other.

The entire building load is carried on four rows of columns. Two outside rows of 12 in. square and two inside rows of circular columns 20 in. in diameter. The molds for the 20-in. circular columns were formed of 16 gauge galvanized iron and were very satisfactory, giving a perfectly true and smooth surface. The column reinforcement consists of four vertical rods to which were attached a series of hoops 1½ in. wide and ⅛ in. thick, spaced 4 in. apart. In this connection it might be well to state that the vertical rods are considered useless as far as carrying the load is concerned, and come into play only when the column acts as a beam due to eccentric loading. The theory of this design is that compression is not a stress in itself, in reality failures by compression are failures by secondary tensional stresses within the material. It has been found by a long series of tests that a column failure is always due to a tendency of the concrete to bulge, consequently the strength of this design depends, above a certain loading, upon the strength of the bands encircling the concrete. Unit stresses as high as 10,000 lb. per square inch have been developed without signs of failure. These bands are rigidly attached to the verticals for spacing and have a projecting fin that holds them to the proper distance from the form.



Cross-Section of the Reinforced Concrete Shop Building of the Taylor-Wilson Co.

Where the column runs into the beam the area is increased. The reason for this is that higher unit stresses are allowed in the hooped column than in the beam, so it is necessary to increase the area at the junction.

The main beam of the building was designed for a 30-ton crane, and spans 20 ft. between the circular columns. In section the beam is 18x36 in., and has an upper flange. This upper flange takes care of the thrust due to the cross travel of the crane.

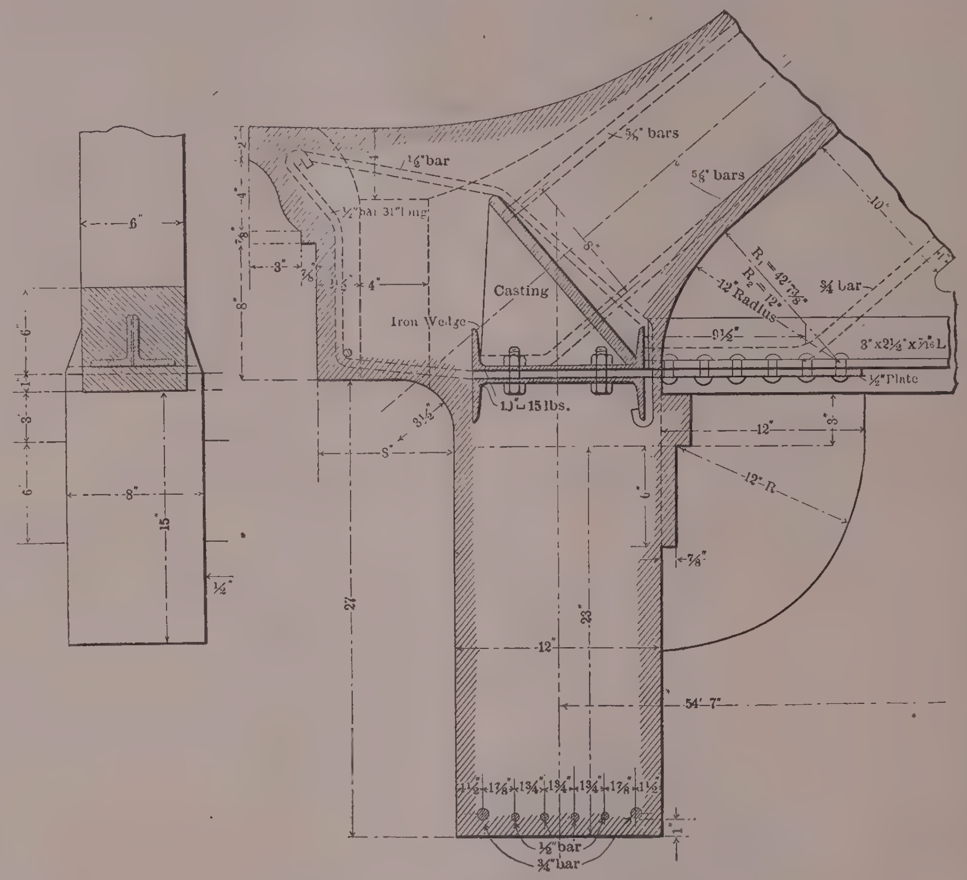
The illustration shows the reinforcement, practically in the form of a Pratt truss running continuous over the columns. The bars are in the form of loops bent up at the ends to take care of the shearing stresses. The advantages of this loop are that it is self-supporting and utilizes the material economically. While a great deal of metal is necessary at the center of the span to take care of the tension, due to bending moments, these bending stresses decrease toward the supports and the same metal section is not required at the bottom of the beam, so is utilized to take care of the shearing stresses. For supporting the rods and keeping them spaced properly and away from the form a little device stamped from sheet metal is used. This spacer is notched out and parts bent down to support it, leaving openings to receive the bars. It was found to be far better than any system of concrete block support for the reason that it held the bars rigidly in their proper position.

Covering the main aisle, spanning 54 ft., a concrete arch was constructed 4 in. thick at the crown and 10 in. at the haunches. The arch reinforcement consists of ⅝-in. bars 9 in. on centers, running across the arch. Running up and down the roof, laced between the ⅝-in. bars are a number of strips of band iron 1x⅛-in. arranged so that in case the rods at the intrados and extrados act in compression there will be no danger of buckling. This design was based upon the elastic theory, using Cains' method.

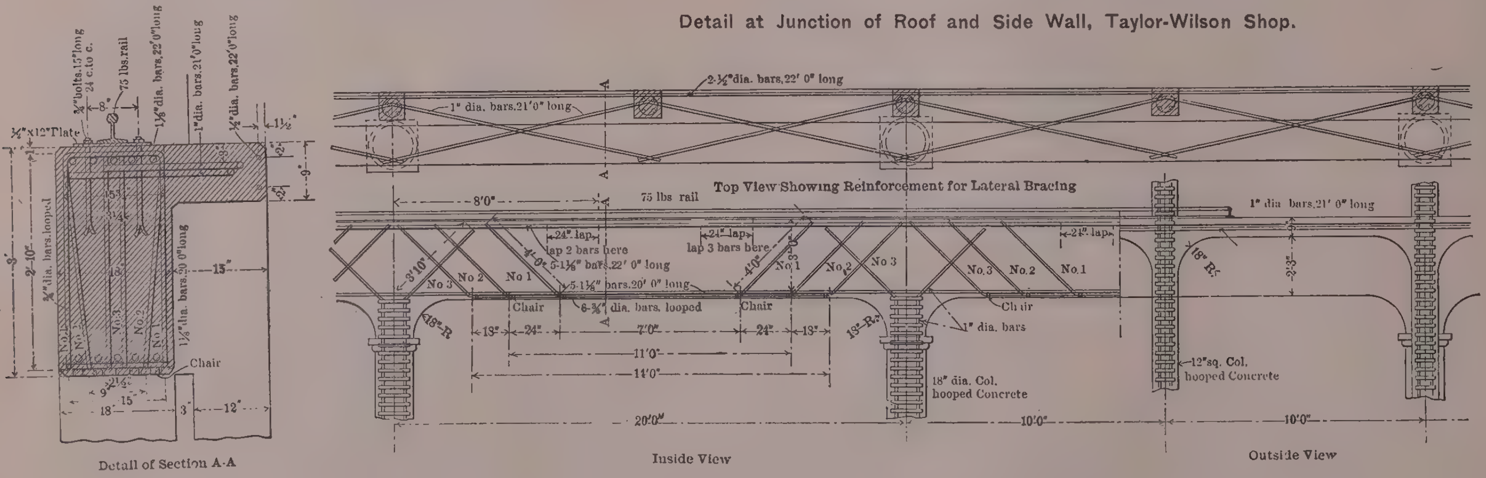
To take care of the thrust of the arch, tie rods made up of two 3x2½x7/16-in. angle irons were used, spaced 10 ft. apart. These tie rods were bolted to two 10-in. 15-ft. channels back to back, shown in one of the accompanying cuts. The channels distributed the load, due to the thrust between the rods. A light skewback casting was placed in the upper channel to act as a spacing member for the roof rods and to transfer the load to the tie rods. To take care of the uncommonly large temperature stresses that would naturally be developed in such a large thin area, expansion joints were made every 10 ft. in the arch. The entire arch was constructed during the coldest winter months. A system of heating by live steam was installed to prevent freezing. Any system for heating concrete work that does not provide moisture as well as heat should not be considered. It is absolutely essential that concrete should not be forced to take its set quickly. Concrete that is reinforced with steel should not be protected from freezing by the use of salt. The reason for this is obvious, salt and air corrode steel quickly, and concrete, especially concrete placed in the winter, is liable to be somewhat porous and air will get in. The heating system by means of live steam jets was very satisfactory and no bad effects were experienced from frost.

On the front elevation of the building, the concrete moldings about the arch windows and the cornices are tinted to a dark red color that has a very pleasing effect to the eye in combination with the dull gray of the concrete. The side elevation is almost entirely taken up by windows. The light inside the shop is nearly as good as out of doors.

The unit cost of this work was approximately 3¼ cents per cubic foot. The building as completed is as near fireproof as is possible in any style of construction to build. Paint is unnecessary on its surface to protect from the elements. The insurance rate made by the Board of Fire Underwriters is 30 cents per hundred, and it is considered by them to be the best risk in the Pittsburg district.



Detail at Junction of Roof and Side Wall, Taylor-Wilson Shop.



Detail of Section A-A

Inside View

Outside View

General System of Reinforcement of Crane Girders In Taylor-Wilson Shop.

THE ILLINOIS CENTRAL R. R. TELEPHONE SYSTEM, which is also used for telegraph service and is in operation between Chicago and St. Louis, is to be extended from the latter place to New Orleans.

Book Notes.

Messrs. Longmans, Green & Co. of New York and London have undertaken a series of volumes to be known as the "Architect's Library," which probably has the most ambitious program of any technical encyclopedia yet undertaken. It is to be a series of treatises by specialists and will start off with a three-volume "History of Architectural Development," by Prof. F. M. Simpson, of University College, London, and a two-volume discusssion of "Building Construction," by Prof. Beresford Pite. The first volume of the series, which recently appeared, is an admirable history of the development of architecture from the earliest Egyptian period down to the conditions in 1,000 A. D. The inevitable comparison of the work with Fergusson's masterpiece shows that Prof. Simpson has abandoned the former's intricate analysis in favor of more illustrations and greater attention to the construction details of the different periods, thus producing a work which is more useful to the engineering reader than

Fergusson's treatise, invaluable as the latter may be to the architect. Prof. Simpson is also a particularly safe guide for the general reader, for he does not indulge in the numerous speculations that disfigure many works on the history of early architecture, nor does he continually ride some æsthetic hobby horse. For example, he very carefully refrains from overestimating the character of Egyptian architecture, and points out that the great painted columns and conventionalized lotus capitals of the Nile temples are in no sense on the same plane with the true art of the Greeks. In his chapters on the Greek architecture he is particularly happy in showing the predominating influence of proportion rather than scale, the care with which details of construction were worked out so that it is hard to say at times whether construction determined form or form determined construction and the real meaning of some of the refinements of detail, such as the entasis of the columns and the rise of the podium steps. Although the chapters on Greek architecture are interesting, it is probable that the engineer will find even greater pleasure in the section of the book describing the Roman works. The Romans were essentially builders; heavy construction was one of their great national characteristics, and, as Prof. Simpson well says, "if the Romans had only possessed the artistic sense of the Greeks, their architecture would have been the grandest the world has ever seen." It is most interesting to read in this book of the great structural achievements of the Romans, for the author is particularly instructive where he has to point out the difference in the results of development based on bolder construction as compared with more refined artistic form. This first volume of the proposed "Library" is so instructive and so accurate that the publishers as well as the public have good reason to be satisfied with the manner in which this large undertaking has been started.

The editors of "Beton und Eisen" have begun the publication of a diary for the use of designers of concrete and reinforced concrete structures. This announcement will not mean much except to those who know the great value of the technical information which the German professional diaries contain. They take the place to a considerable extent of the pocketbooks of tables and memoranda used by American engineers, and being revised annually, are always up to date. This particular example is a book of 516 pages 16mo size, bound in cloth, and of these 516 pages but 27 are reserved for calendar and memoranda. The remainder are filled with mathematical tables and formulas, notes on the properties of materials, the important laws of mechanics and a series of short articles by specialists on foundations, masonry, columns and piers, the theory of reinforced concrete beams, floor construction, roofs and skylights, stairs, methods of carrying on concrete work, reinforced concrete girder bridges, arches and arched bridges, industrial and business buildings, silos, theaters, high chimneys, pavements, river and harbor works, water works, sewerage sewage disposal works, weirs, dams, water power development, reservoirs, art wares of concrete data concerning the cost of all kinds of concrete and reinforced concrete structures, and various official rules and regulations for concrete and reinforced concrete. Although the book is so small in size, it is safe to say that it is at once the most comprehensive, accurate and practical manual of concrete and reinforced concrete construction yet produced, and has the great merit of costing but 3 marks in Germany, equivalent to 75 cents of American money, although the cost of importing it will doubtless about double its German price Even at $1.50 it will be a remarkably good bargain for anyone sufficiently acquainted with the German language to use the data in it. Naturally in a book containing chapters by numerous authors there will be some overlapping of subjects, but this has been kept down very well by the editors of this volume. It contains descriptions of all the leading systems of reinforced concrete construction and is particularly useful as a reference book of rules and tables for the calculation of about everything for which concrete is employed. (Berlin, Wilh. Ernst & Sohn.)

Gas, Gasoline and Oil Engines, Including Producer Gas Plants. By Gardner D. Hiscox. New York, Norman W. Henley Pub. Co.; cloth, 8vo, 442 pp., $2.50.

This is the fifteenth edition of a book which appeared only a few years ago. It is, however essentially a new book, for it has been entirely rewritten so as to include various late forms of engines and accessory plants. The author states on the title page that it is "a complete and practical work on gas, gasoline, kerosene and crude petroleum oil engines, including producer-gas plants for gas owners, fully describing and illustrating the theory, design, construction and management of the explosive motor for stationary, marine and vehicle motor power." This statement is a good example of the execrable English in which the book is written, the style being so extraordinarily bad in places that it is difficult to understand just what idea the author is trying to suggest. In spite of this serious fault, the author furnishes a great deal of useful information concerning the construction of many types of internal combustion engines, for which he uses the rather terrifying term "explosive motors," and his explanations of the manner in which various parts of such an engine work are generally very good. The few notes on the theory of internal combustion engines should not be continued in future editions, for they are not scientifically correct. So far as the book is a description of engines and their parts it seems to be reliable, and as a large proportion of the pages are devoted to information of this class the reason for the success of the volume is easily seen. When the author goes beyond mere description his treatment is likely to be superficial and inaccurate.

Portland Cement, Its Manufacture, Testing and Use. By D. B. Butler. Second edition, revised and enlarged. New York, Spon & Chamberlain; cloth, 8vo, 406 pp.

The author of this work is the successor of the late Henry Faija and one of the leading authorities on the testing of cement, while his long experience in an advisory capacity to manufacturers of the material and to engineers enables him to speak with certainty concerning its production and use. The first edition of his book appeared about six years ago, and as it was confined to British practice it naturally did not discuss certain methods of manufacture which were even then in practical control of American mills. In the few years that have passed since then, many of these American methods have been introduced into Great Britain, particularly the use of rotary kilns, and Mr. Butler has revised his book in all such respects. Consequently, while it is still an exposition of procedures in the author's country, it is more in harmony with those of America than the earlier edition.

The introductory chapter is an outline of the history of the material and the industry. The second chapter is on raw materials, and here there will be found some statements that need explanation before they can be properly understood by the American reader. For example, the cost of producing cement by the dry process is stated to be so much higher than that where the wet process is used that the dry process can only be employed in factories working for local trade. In explanation of this condition it should be added that the wet mills are located, as a rule, in particularly advantageous positions, with the chalk beds near at hand, excellent facilities for dredging and barging the river mud which is used as clay, and remarkably good facilities for distributing the finished cement by water. On the other hand the dry process mills, located inland, have to struggle against the very high freight rates in Great Britain, which are almost inconceivable to an American manufacturer. Consequently the more favorable financial showing of the wet process in Great Britain is not due to technical so much as to commercial advantages. It might be added that the author makes some rather more favorable statements concerning the use of the lime waste from alkali works as a cement material than American experience to date will justify.

The third chapter is on wet mills and the procedures followed in the wet and semi-wet processes. The British makers using these processes have special difficulties on account of the pieces of flint in the chalk which forms one of the raw materials used, and the explanation of the methods of overcoming these difficulties is an interesting feature of the book. The chapter on drying floors and kilns contains a large amount of interesting information concerning the methods employed in drying slurry and calcining it in vertical kilns, but its review of British experience with the rotary kiln is doubtless the most important portion of the entire book to the American cement maker. In it the author states that the introduction of this type of kiln led to very extensive changes in the clinker grinding machinery as well, for the product of the older dome kilns was so much softer than that from the rotary kilns that it did not need the high grade mills used in America. The author points out the well-known quick-setting property of rotary clinker when gypsum is not added or the clinker is not watered, and also the difficulty of eliminating the underburned product by hand picking, as is done with dome cement. He also seems to consider fine grinding more important with the product of the rotary kiln than with the older class of material; this is the inference to be drawn from his remarks concerning the rapid increase in strength of rotary cement between three and twenty-eight days. The author's views on clinker grinding machinery, given in the following chapter, are very largely at variance with experience in America with rotary clinker.

The chapter on the dry process is interesting as showing how it has been developed from the wet process in Great Britain. For example, although some rotary dryers are used for the raw materials drying floors such as are employed in driving off the water of slurry are extensively employed. The materials are ground by "millstones or other convenient machinery," mixed with water in a pug mill, and then run through a brick machine. This process is in itself a partial explanation of the high cost of the dry process of manufacture, and British manufacturers using it would do well to investigate a modern American mill. The great importance of fine grinding the raw materials in the dry process rotary-kiln plant is not sufficiently emphasized in the book.

The remainder of the book is mainly useful as explaining the British practice in testing cement Thanks to the good work of the American Society for Testing Materials in preparing standard specifications for cement and the American Society of Civil Engineers in suggesting uniform methods of making tests, the American engineer has this part of his work well standardized. In the same way standardization has been taking place in Great Britain, as explained in a paper by Mr R. W. Lesley, recently printed in this journal. Mr. Butler's book has been revised so as to be in accord with the new standards. He takes up in turn soundness, fineness, tensile strength, setting properties, weight, specific gravity, color, and chemical composition. The adulteration of cement with limestone and slag is the subject of a very interesting chapter, in which the author gives the results of his long experience in detecting the presence of such materials. In one case he mentions finding 33 per cent. of adulterant.

Letters to the Editor.

Gravel Concrete.

Sir: In the editorial on gravel concrete in the Record of Nov. 11 the question of adhesion of concrete to gravel is raised. About 40 years ago I built a 20x30-in. concrete sewer. The pipe was in 3-ft. lengths and about 2 in. thick, and was manufactured in Brooklyn from gravel and cement. We had occasion to cut several lengths, and in no case did I see a pebble loosened. On the contrary, quantities of hard pebbles broke square across. The details of manufacture I was unacquainted with; but I knew that a pipe which rang like metal when struck, must be safe to use. I think the sewer is still performing its functions satisfactorily. F. Collingwood.

Elizabeth, Nov. 23.

Difficult Meadow Road Construction.

Sir: Before the year is over I wish to call your readers' attention to one of the most troublesome pieces of road building that has ever come under my observation. It is the road between Atlantic City and Pleasantville, in New Jersey; it is 6 miles long, 60 to 100 ft. wide and about 10 ft. above the surrounding meadow surface, at least that was the plan as originally drawn up and approved by the State Highway Commissioner. The line runs over a typical Jersey salt meadow, interlaced with a lot of tidal creeks and streams, some of which must be kept open for flatboat navigation. Other roads had been built over these meadows without any very serious trouble and it was expected that this one could be constructed without greater difficulty. The contract for the work was let to Hess & LeChard, of Atlantic City, a thoroughly experienced firm of dredging contractors, who undertook to build the highway by filling sand over the salt meadow, this sand being obtained by dredging.

The work was started two years ago, and it was then expected that it would be completed in one working season. The first indication of trouble was observed on a 2-mile stretch which was about half filled in. The work was shut down for a few days during a heavy storm, and when it was resumed the engineers noticed that a settlement had taken place. The amount of sand discharged on this section by the dredges was increased, but the settlement continued in spite of various measures to confine the filling to the limits of the roadway by means of bulkheads and plank walls. The settlement continued, and the land in the vicinity rose until at places it was 3 to 6 ft. higher than its original elevation, while small creeks choked up entirely.

Long before the contractors reached bottom with their filling they had spent more money than their payments from the authoritites on the completion of the road would amount to, but they kept right on in a way that deserves praise. They brought up a powerful dredge and eventually secured control of the meadow. At least, when I left Atlantic City last May the work was practically done. Whether it was finally finished I have not heard, but assume that it was, as all the difficulties seemed to be past at that time.

Although the way in which these contractors carried through a losing contract appealed strongly to me, I could not help wondering whether it was good engineering to build the road according to the plan that was followed. I have often observed that a marsh will carry a heavy load provided it is spread out and the crust of the marsh is not cut. Some years ago I traveled over a number of very good roads in Ireland, crossing very wet bogs, and was told that they were made by putting down brush on the surface of the bogs, before placing earth on the road. In some fresh-water marshes south of this city roads were made years ago by laying plank over the surface of the marsh, the plank resting on sills running longitudinally. If I am not mistaken there is an important street in our Hyde Park district that was built in this way and is still in service. This construction of roads across marshes is likely to be a serious problem with me during the coming year, as I expect to have several such crossings to build on a road over which heavy teams from quarries will pass, and if any of your readers have had experience along this line I wish they would tell about it in your columns, for there must be others as well as myself who will profit materially from it.

Very truly yours, Patrick Saunders.

Chicago, Dec. 5.

High Grade Concrete.

Sir: In your editorial of Dec. 9 on features of hydraulic power development you refer to the apparent inability of American engineers to secure impervious concrete. You also give an example of a concrete conduit running under a high head which remains water-tight after several years of service. This is a matter that I have observed myself, to my sorrow. It was my good fortune to be trained in concrete construction under one of the most conscientious contractors in Germany. This gentleman had made a scientific study of concrete and the materials entering into it, and taught his staff to look at concrete manufacture as something more complicated than making mud pies. We were taught a great many things concerning the selection of materials and their manipulation so as to secure desired results, none of which are apparently regarded at all in America.

One of the things we were taught was to make impervious concrete. Of course, this does not mean concrete which will not show dampness on the surface if subjected to a heavy water pressure, for such concrete cannot be made for use in relatively thin walls, but it means concrete which will not permit any percolation of the water through it. It is often denied that such material can be produced, but there are plenty of European contractors who will furnish it if they are paid enough for the work. The trouble seems to be that the cost of high grade work in concrete is not recognized here, at least the cost of such work as is necessary to produce impervious concrete and ornamental objects. These cannot be obtained by the same methods that are followed in securing granolithic sidewalks, which seem to be the highest type of concrete in the opinion of many people who ought to know better. Soon after I came to this country I was engaged as foreman on the construction of some small basins which were required to be water-tight by the terms of the contract. Naturally enough I started in to construct them in accordance with the methods used by my old employer in Germany. After finally securing enough materials to make a start, which was not easy because of the trouble of obtaining finely crushed stone and suitable sand, the work was begun. None of the men knew how to mix or lay concrete for such work, and consequently not much was in place when I received a vigorous note wanting to know why I had not finished the job. Evidently my reply was not agreeable, for the next day the contractor's superintendent came down and discharged me with the information that his master did not intend to be ruined by any Dutch crank. The work was finished under his supervision, the concrete being of the grade used for foundations for walls and without any water-tightness whatever. It was not accepted and he had to pull it out and replace it in two layers with a course of some waterproof material between the courses. The expense was several times what the standard German method of construction would have been, although the latter would doubtless cost more than the sum this contractor bid.

It is also apparent that owners of reinforced concrete buildings are running great risk in giving contracts for such structures to inexperienced contractors. Not long ago I saw such a building in your city in which there was a place in one of the floors where the materials had been so poorly mixed that they fell out when the forms were removed. If such a thing happened in Prussia it is not unlikely that the contractor would be put out of business by the government. I do not make this criticism in a carping spirit, but merely to indicate that the trade of the American concrete masons has not yet reached the development it has in my native land, owing to the failure to distinguish between the very different requirements to which concrete must be adapted by variations in materials and their handling, and to the unwillingness to pay a fair price for really good concrete for such purposes as tanks and pipes.

Yours truly, Karl Lehrmann.

New York, Dec. 9.

A Light Steel Roof.

A very light steel roof has recently been built in New York City and shipped to Porto Rico for the Humacao Sugar Co. It is designed principally to shelter machinery and is supported on steel columns without wall enclosure. It is L-shaped in plan, with one 96x216-ft. wing and one 120x144-ft. wing, united to make two 216-ft. faces and containing one 48x72-ft. central open court. The roof of corrugated iron on wooden purlins is designed to carry only its own weight and a wind pressure of 40 lb. per square foot of vertical projection. The building covers about 10,000 square feet and, including a 35-ton machinery platform, had a shipping weight of only about 150 tons. The columns are in longitudinal and transverse rows respectively 24 and 48 ft. apart and in all cases extend to the top chords of the trusses, thus securing deep connections to afford stiffness against wind stresses. Exterior columns are 25 ft. long and are made of pairs of 6-in., 8-lb. channels latticed, the interior columns, 37 ft. long, are made of pairs of 7-in. 9¾-lb. channels latticed, or of pairs of 8-in., 11¼-lb. channels latticed. The tops of exterior columns are connected by lattice girders 24 ft. long and 5½ ft. deep, with the top flanges made of pairs of 3x2½x¼-in. angles, and the bottom flanges of pairs of 2¼x2¼x¼-in. angles. All roof trusses are of 48-ft. span and have their principal supports at the top chords with pairs of vertical connection angles riveted to the column webs. The extensions of the lower chords are supported on shelf angles on the columns. The bottom chords of the monitor trusses are made of pairs of 8-in., 11¼-lb. channels. In all other trusses, the bottom chords are pairs of 2½x2½x¼-in. angles and the top chords do not exceed pairs of 4x3x5/16-in. angles. The web members of all trusses are pairs of 2¼x2¼x¼-in. angles, all rivets are ⅝-in. and all field connections are riveted. All trusses were shipped in two completely riveted halves. The building was designed for the Pioneer Iron Works, Brooklyn, by Mr. Nathaniel Roberts, and was fabricated under a sub-contract by the J. B. & J. M. Cornell Co., New York, Mr. A. E. Roberts in charge of shop drawings. The structure is in reality a complete steel building not differing materially from such work largely exported for industrial purposes in South America and other warm countries, though pains were taken to reduce the weight to an amount consistent with safe design.

CURRENT NEWS SUPPLEMENT

DECEMBER 16, 1905.

DIRECTORY OF NATIONAL TECHNICAL AND TRADE SOCIETIES.

American Society of Civil Engineers. Secretary, Charles Warren Hunt, 220 West 57th St., New York. Next meeting, Dec. 20. Paper on Inspection of Treatment for Protection of Timber.

American Society of Mechanical Engineers. Secretary, F. R. Hutton, 12 West 31st St., New York.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, 95 Liberty St., New York Next meeting, Jan. 26, 44 West 27th St., New York.

National Fire Protection Association. Secretary, W. H. Merrill, Jr., Chicago.

American Institute of Mining Engineers. Secretary, R. W. Raymond, 99 John St., New York.

American Institute of Architects. Secretary, Glenn Brown, Washington, D. C.

Association of Engineering Societies. Secretary, Frederick Brooks, 31 Milk Street, Boston, Mass.

American Society of Heating and Ventilating Engineers. Secretary, W. M. Mackay, 235 Water St., New York.

Canadian Society of Civil Engineers. Secretary, Clement H. McLeod, 877 Dorchester St., Montreal.

American Public Health Association. Secretary, Dr. C. O. Probst, Columbus, O.

Society for the Promotion of Engineering Education. Secretary, Prof. M. S. Ketchum, University of Colorado, Boulder, Colo.

American Society for Testing Materials. Secretary Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Municipal Improvements. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y.

Association of Railway Superintendents of Bridges and Buildings. Secretary, S. F. Paterson, Concord, N. H.

American Railway Engineering and Maintenance of Way Association. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago.

American Water-Works Association. Secretary, J. M. Diven, Charleston, S. C.

American Foundrymen's Association. Secretary, Richard Moldenke, P. O. Box 432, New York.

Engine Builders' Association of the United States. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

''**American Public Works Association.** Secretary, W. H. Flint, Chattanooga.

Association of American Portland Cement Manufacturers.. President, J. B. Lober, 1232 Land Title Building, Philadelphia.

American Society of Refrigerating Engineers. Secretary, H. W. Ross, Room 806, 258 Broadway, New York.

National Association of Manufacturers of Sand-Lime Products. Secretary, H. A. Duerr, Wilmington, Del.

National Association of Cement Users. President, Richard L. Humphrey, Harrison Building, Philadelphia, Pa.

A SHIP-BUILDER'S CLAIMS FOR LOSSES DUE TO GOVERNMENT DELAYS.

At the present time the Court of Claims has before it a large amount of litigation growing out of numerous contracts with the United States for various public works. Some of this arises under the operations of the Engineer Corps of the Army, and some under the Navy Department. The cases present many questions of interest to engineers and contractors. A very large claim made by the William Cramp & Sons Ship and Engine Building Co. has just been argued. The claim arises out of the delays caused by the failure of the Government to furnish armor plate to the ship builders in building the battleship "Indiana." The contract was signed Nov. 19, 1890, and provided that the vessel should be completed in three years. It took five years to complete her, and the Secretary of the Navy officially decided that the delay was not due to the contractors, but was due to the armor plate not being furnished in time. The contract consumed five years instead of three, and the contractor now sues for damages to the amount of $480,231.90.

The claim is made up of a number of items—the value and the use of the yard and plant during the extended term; a charge for the special wharfage facilities enlarged; for the care and maintenance of the vessel during the two years; for insurance upon it; for interest on money borrowed on account of the delay; for the expenses of a trial trip, and for loss of premium because the trial trip was undertaken with a foul bottom incident to the delay.

The Government defends upon the ground that a modification of the original contract was made in May, 1894, and that modification embraced an absolute release of all claims for damages accruing up to that date. The Government presents also a complete release in full, signed when the final payment was made upon the vessel. A further defense is made by contending that the contract provided that if the contractor was delayed by reason of the failure to furnish armor plate there should be an extension of the contract. This, it is contended, is in lieu of the payment of damages for delay.

The contractor denies that the release covered any claims for delay, since these were not cognizable by the Secretary of the Navy. That defense is strongly upheld by previous decision of the Court. The position is also taken that the extension of the contract does not involve an abandonment of any claim for damages on account of the delays as alleged. The decision will probably be reached by the first of January.

WATER PIPE THAWING OUTFITS

The superiority of the electric current as a thermal agent is generally recognized and its convenience and effectiveness have led to its utilization in the thawing of water pipes, gas mains, telephone conduits, and the like. It is necessary that the apparatus for such purposes shall have a range in capacity adequate to cover all ordinary requirements; shall be easy to connect and moderate in price; shall be portable and light in weight so as to be easily handled; shall be able to withstand rough usage and shall insure protection from injury to the operator.

TRANSFORMER FOR PIPE THAWING.

The Westinghouse Electric & Manufacturing Co. has placed on the market two outfits, one for heavy service, comprising a specially designed choke coil used in connection with the primaries of a standard transformer, and one for lighter service, consisting of a transformer adapted for suitable secondary voltage adjustments mounted in cast-iron top and bottom frames. The heavy duty outfit consists of the choke coil connected in series with the primary of a standard 2,200-volt, 60-cycle transformer of from 15 to 25-k.w. capacity. The choke coil is compactly built and enclosed in a cast-iron case which occupies a floor space of 16 x 16 in. Five plug receptacles mounted in the upper portion of the case provide a simple means of varying the primary voltage. The various taps give approximately 50, 60, 75, 87 and 95 per cent. of the full line voltage. By changing the position of the plugs, any one of these combinations may be used.

The smaller outfit is intended for lighter service, such as thawing house piping. It is compactly built and enclosed in a case with cast-iron top and bottom, the transformer laminations themslves being exposed to the air, thus providing excellent conditions for cooling. Handles are provided on the top casting which will enable one man to carry the transformer, as its weight complete is approximately 100 lb. It is intended for use on 2,200-volt, 60-cycle circuits, and has a variation in secondary voltage from 55 to 35 and will maintain a current of 100 amperes for one half hour without undue heating. No oil is used with this transformer, as the insulation is specially prepared to withstand severe conditions.

In operation the transformer should be placed as near the pipes to be thawed as possible. For dwellings one low-tension lead may be connected to a faucet and the other to a hydrant so as to enclose the frozen section. For thawing street mains two hydrants may be conveniently used. On account of the different conditions met with it is impossible to prescribe the exact voltage or current necessary to do any particular thawing. In general, the voltage necessary to force the same amount of current over pipes of the same diameter will vary with the length of pipe. Large pipes require less voltage to force the same current through a given length, but require more current to thaw them.

For pipes up to 5 in. in diameter approximately 500 amperes is usually sufficient, while 12-in. mains may require 1,000 amperes. As a rule a small current for a long period of time will do the work that a large current will do in a shorter time, and the thawing will be done with less chance of injury to the piping system.

THE MEETING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS AT NEW YORK.

The fifty-first convention of the American Society of Mechanical Engineers was held Dec. 5 to 8, inclusive, in New York, and was an unusually well attended meeting. Temporary headquarters were taken up at the new auditorium of the New York Edison Company, at No. 44 West 27th St., which afforded the greater freedom of space needed for the increased membership. A feature of the meeting was the Wednesday morning session, which was held upon board the largest steamship afloat, the "Amerika,' of the Hamburg-American line, where the opportunity afforded to visit all portions of the ship was eagerly taken advantage of by the members. On an excursion to the new works of Henry R. Worthington, at Harrison, N. J., over 1,000 were present. The total registration at the meeting was 1,330.

The range of subjects covered in the technical papers presented was not extensive, although certain ones were interesting and instructive in their lines. An important feature was introduced in the form of a topical discussion, in which a valuable interchange of ideas was made possible. The papers presented grouped themselves with respect to their subjects as follows: Fuels, Gas Engine, Machinery, Shop Construction and miscellaneous. One of the most important of the subjects treated at the meeting was covered by Mr. John R. Freeman, president of the society for 1904-05, in his annual address; in this, he gave the results of a long investigation of the problem of fireproofing of buildings, particularly as applied to theaters, which has been very extensive, covering a wide range of personally conducted tests. This address is reproduced in part elsewhere in this issue.

Fuels.—Under this classification there was an instructive paper upon the use of "Natural Gas under Steam Boilers," by Mr. Jay M. Whitham, of Philadelphia. The author, finding a general lack of definite information concerning the use of natural gas under steam boilers, had made a number of tests of boilers, with particular reference to natural gas as the fuel, using various types of burners and also the blue and white flames, and the results are incorporated in his paper. An important feature of this class of testing, namely, the accuracy of the gas meters, was referred to, and also the relative importance of burning the gas with the blue and white flames. His conclusions were stated as follows:

(1) There is but little advantage possessed by one burner over another.

(2) As good economy is made with a blue as with a white or straw flame, and no better.

(3) Greater capacity may be made with a straw-white than with a blue flame.

(4) An efficiency as high as from 72 to 75 per cent. in the use of gas is seldom obtained under the most expert conditions.

(5) The "air for dilution" is greater with gas than with coal, so that possible coal efficiencies are impossible with gas.

(6) Don't expect, in good commercial practice, to get a boiler horse-power on less than from 43 to 45 cu. ft. of natural gas, the same being referred to 60° Fahr. and 4 oz. pressure above a barometer of 29.92 in.

(7) Fuel costs are the same under best conditions with natural gas at 10 cents per 1,000 cu. ft. and semi-bituminous coal at $2.87 per 2,240 lb. This is based on 3.5 lb. of wet coal being used per boiler horse-power per hour or 45 cu. ft. of natural gas.

(8) Expressed otherwise, a long ton of semi-bituminous coal is the equivalent of 28,700 cu. ft. of natural gas; while a short ton of such coal is the commercial equivalent of 25,625 cu. ft.

(9) As compared with hand firing with coal in a plant of 1,500 boiler horse-power output, coal being $2.00 per 2,240 lb.—considering labor saving by the use of gas—natural gas should sell for about 10 cents per 1,000 cu. ft.

The other paper under the heading of fuels was by Mr. R. H. Fernald, upon the "Results of the Preliminary Producer Gas Tests of the United States Geological Survey Coal Testing Plant at St. Louis." The tests carried out by the Gas Producer Division of the coal testing plant were for the purpose of comparing the results with the different grades of coal in the producer and are not in any sense to be considered as tests of the gas producer. The author was hampered by Government restrictions, which prevented some of the most recent results being made public at this time, but a summary of the work was given, together with a detailed account of the apparatus, methods, etc. An important feature of the paper was the illustrations of the log and report forms used in the tests, which were explained. The author, in conclusion, draws attention to a number of important facts that have been determined in the results which he was enabled to present, all tending to indicate that the gas producer power plant can deliver power from the fuel with an efficiency equal to that attained by the steam boiler and compound or triple expansion engines.

Gas Engine.—The paper referring to the subject of the gas engine was entitled "The Pressure Drop through Poppet Valves," by Dr. C. E. Lucke. It was a paper of record, presenting the results of a series of tests carried out by two students at Columbia University as a thesis investigation, having for their object the determination of data on the relation between pressure drop through the poppet valves as ordinarily used in gas engines, and the condition of flow of the gases, form of opening, etc., which affect this drop of pressure. Interesting results were obtained, which tend to show that valves with conical openings are much to be preferred to those of the flat opening, like the Daimler valve, and, indeed, much that is of assistance to the designer was brought out. In the discussion, Mr. Geo. Hill called attention to the fact that very much of the valve problem and the effect upon the pressure drop, lies in the shape of the cams used in operating the valve stems, and offered suggestions as to effective methods of design.

Machinery.—Under this heading there was first a report of the Committee on Standard Proportions for Machine Screws, which was adopted. A new set of machine screw sizes was adopted, for which the principal details had been carefully studied out and two sizes changed to permit a new size to be added; standard forms of reference thread gauges and working gauges for screws and taps were adopted, and allowable limits of variations in angle of thread, in external diameter and in pitch, were defined. Another important feature was the adoption of standard proportions for machine screw heads of all forms, round, flat and fillister.

Another paper under this classification entitled "Tests of Elevator Plant in the Trinity Building, New York City," by Mr. Arthur J. Herschmann, is referred to in full elsewhere in this issue. The plant described is one of interest for the use of the highest-rise plunger elevators in the world. The discussion was participated in by a number of members, but unfortunately became of such an intemperate nature that much which might otherwise have been of value was lost.

Under this heading comes the topical discussion upon the subject of bearings, in which a number of short papers were presented. Prof. R. C. Carpenter discussed the general subject in an interesting manner, pointing out the desired qualities in bearing metals and outlining the advantages of the hard and soft metals. He made an extended reference to laboratory methods of testing, and showed how the great discrepancies in results from the same metals are so often obtained. Prof. Carpenter offered a formula for bearing metal, which he has found to give excellent results, as follows: Fifty per cent. aluminum, 25 per cent. zinc and 25 per cent. tin. Mr. C. W. Taylor presented an interesting experience with water as a lubricant for jack shaft bearings in a lighting plant, which worked satisfactorily for eleven years. Mr. Geo. R. Henderson and Mr. Geo. M. Basford presented discussions of the subject of bearings as encountered in the modern heavy locomotives, in which were pointed out the limiting factors and peculiar conditions governing the problem. Mr. Albert Kingsbury presented an interesting account of a series of tests of large shaft bearings which were recently made by the Westinghouse Electric & Mfg. Co., at Pittsburg, in which interesting facts were revealed. The oral discussion turned toward ball and roller bearing practice, and the remainder of the time allotted to the topic was spent in statements and comparisons of the latest practice in this direction.

Shop Construction.—The paper under this classification entitled "Reinforced Concrete Applied to Modern Shop Construction," by Mr. E. N. Hunting, appears elsewhere in this issue. It elicited an interesting discussion, this being the first paper upon this subject which has been presented before the society. It was a generally expressed opinion that reinforced concrete construction should not exceed mill construction in cost by more than 5 to 10 per cent., except in certain few localities. The question of the type of construction was discussed, with references also to the use of concrete blocks, and accurate testing of the various forms of construction as applied to any particularly severe conditions was recommended. Mr. Geo. Hill advocated absolutely flat roofs under concrete construction and pointed out advantages to be gained from their use.

Miscellaneous Subjects.—A feature of the meeting was the lecture by Prof. R. W. Wood, of Johns Hopkins University, upon the "Photography of Invisible Phenomena." A series of most remarkable photographs were reproduced, which illustrated the behavior of bullets moving through the air and their effect upon the latter, the phenomena of reflection of light between mirrors, etc., a refinement of physical science concerning which little has until recently been known; since recent developments in instantaneous photography, however, remarkable phenomena have become known. The paper entitled "Measurement of Air Flowing into the Atmosphere through Circular Orifices in Thin Plates and under Small Differences of Pressure," by Mr. R. J. Durley, was another paper of record, presenting the results of a series of tests which had been made at McGill University under the author's direction; a number of theoretical conclusions were reached. The paper by Mr. H. F. J. Porter, the "Realization of Ideals in Industrial Engineering," concluded the convention.

ELECTRIFICATION OF AN IMPORTANT RAILWAY.

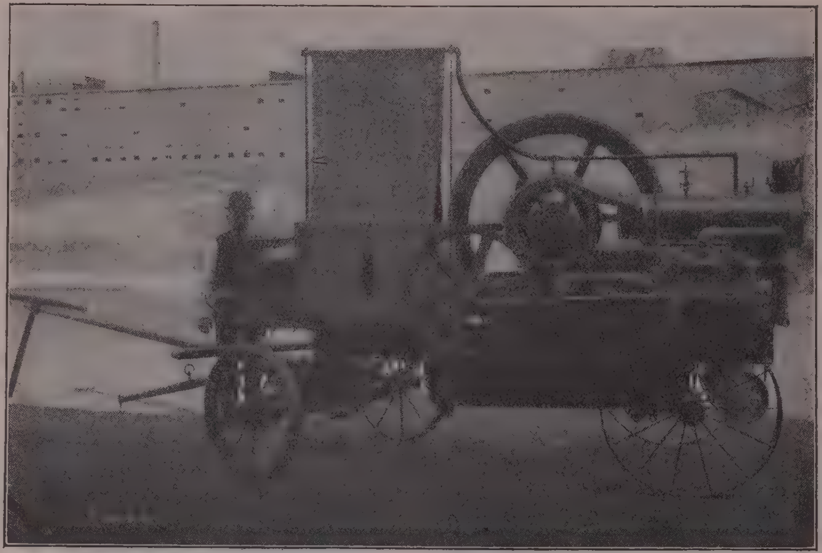
The Pennyslvania Railroad Co. has given the General Electric Co. a contract for the electrification of one of its lines from Philadelphia to Atlantic City, involving an expenditure of from $2,000,000 to $3,000,000. This statement, made officially recently, puts to rest the rumors in circulation for some time past regarding plans proposed by the Pennsylvania Railroad for this line.

As a railroad project, it is in more ways than one unique, and is the first contract of its kind, so far as is known, that has ever been awarded. It means the discarding of the entire equipment of the line involved, or, at least the transferring of the succeeded steam equipment to the other lines of the company. It differs from the contracts let hereabouts for the equipment of steam lines with electricity, in that such contracts are only for short parts of main line, and in most cases the changes were impelled to facilitate the movement of trains in terminals.

About 60 miles of line in all are to be converted to electricity. Included in the contract is the necessary power station equipment which calls for Curtis turbines. Cars are to be equipped with the Sprague-General Electric multiple-unit control, and are to be run just as are the trains in the subway and on the elevated. Work on the changes, it is officially stated, will be begun at once, and after they are completed trains will be run every 15 minutes. A local service of this kind will also be maintained between Philadelphia and Millville and Philadelphia and Woodbury.

PORTABLE AIR COMPRESSORS FOR THE PANAMA CANAL.

The Isthmian Canal Commission recently placed an order with the Rand Drill Co., of New York, for two portable air compressors which embody some features of distinct novelty. These machines are intended to operate pneumatic tools in general repair work in the canal service. It is also expected that they will be found of great assistance in erecting the heavy machinery which of necessity will be delivered in sections along the line of work.



PORTABLE COMPRESSOR FOR ISTHMIAN CANAL COMMISSION.

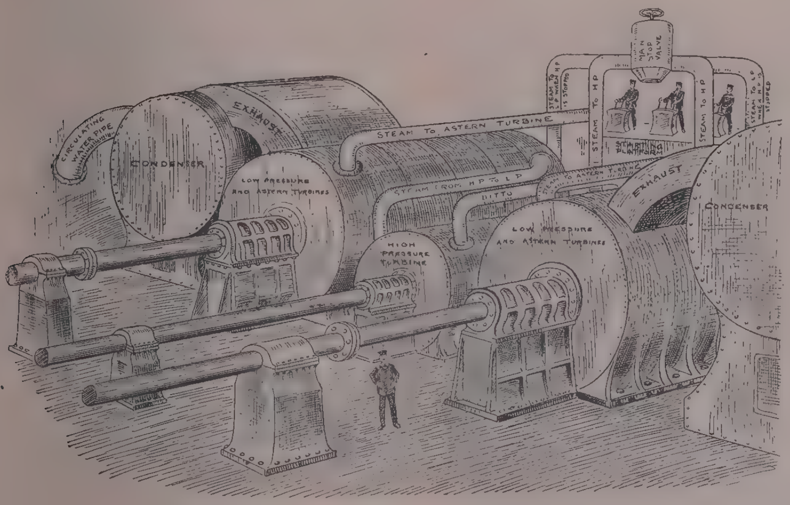
The illustration gives a very good idea of the arrangement of these plants. The prime mover is a 16 h.p. gasoline engine. It is mounted on two steel channels which constitute the frame of the truck. The engine shaft has at one end a heavy fly-wheel 4 ft. 8 in. in diameter; at the other end is a driving gear fitted with a friction clutch. Below and at one side of the engine, a small Rand single-stage air compressor is mounted, fitted with the usual mechanical intake and automatic discharge air valves made by this manufacturer. The crank gear of the compressor meshes directly with the driving gear of the engine and a valve rod operates the air valve gear by means of a back crank. The engine is of course started unloaded, with the friction clutch free. When full speed is attained, the clutch is thrown in and the load on the air compressor assumed. Gearing is such as to give the compressor a speed of 150 r.p.m., at which the displacement of the compressing cylinder is 60 cu. ft. of free air per minute which is delivered at a pressure of 100 lbs.

A novel feature of this equipment is the method of cooling circulating water for the engine and compressor cylinders. While provision is made for connection with an outside source of water wherever available, it has also been arranged for the machine to carry its own water supply. A rectangular open tank holding about 100 gals. of water is mounted on the truck in front of the engine. A small pump driven from the engine shaft draws water from this tank and circulates it through the cylinders of the engine and compressor. This water, heated by contact with the cylinder walls, flows upward to a perforated pipe elevated above the supply tank. It is here discharged through a series of fine holes and flows downward over a sheet of burlap to the tank below, being cooled by evaporation by exposure in a thin sheet to the open air. An air receiver 18 in. by 4 ft. 6 in. is suspended benath the truck and between the axles. A gasoline tank with a capacity of about 30 gal. is hung from the truck in the rear. The entire machine runs on steel wheels. The total weight of this compressor outfit is 8,500 lb. It has a wheel base 7 ft. long, with a tread of 5 ft.

Among other items on the same order for these portable air compressor plants were four Imperial air hammers, two Imperial wood boring machines and two Imperial rotary drills, together with a full supply of repair parts and accessories, such as hose and couplings.

THE CUNARD LINER CARMANIA.

The Cunard liner Carmania reached New York on December 10 and on December 12 her owners invited a number of engineers to inspect her, thus affording an opportunity to Americans to see an aspect of marine steam engineering that is practically undeveloped in the United States. The vessel is 650 ft. long between perpendiculars and 672½ ft. over all. Her moulded width is 72 ft. and moulded depth 52 ft. Work on her hull was started in the Clydebank yards of Messrs. John Brown & Co. on Feb. 29, 1904, and she was launched a year later. The final completion was somewhat delayed to enable the makers to conduct elaborate experiments to determine the most satisfactory details for much of the equipment, which is of an unprecedented size in turbine construction. The hull required about 12,000 tons of steel and 1,800,000 rivets. The details of the framing and plating presented a number of novel features.



ARRANGEMENT OF TURBINE IN CARMANIA ENGINE ROOM.

The Carmania is a sister ship of the Caronia, now in service, save for the fact that the latter has quadruple-expansion engines with 39, 54½, 77 and 110-in. cylinders, the stroke being 5½ ft. The accompanying diagram, furnished by the Cunard Steamship Co., shows the arrangement of the Carmania's turbines. There are three shafts, the high-pressure turbine driving the center shaft and each side shaft having a low-pressure and astern turbine, in other words, a turbine which runs in either direction. The turbines and reciprocating engines occupy the same area, but the former obstruct the space much less, and save about 5 per cent. in weight. The boilers in the two vessels are the same, but those of the Caronia run under 210 lb. and those of the Carmania under 195 lb. Each vessel has eight double-end and five single-end boilers, in two separate boiler rooms, and are rated at 21,000 h.-p. The condensing surface in the turbine ship is 20 per cent. greater than that in the other, and the circulating pumps of twice the capacity, so that the amount of circulating water is fifty to sixty times the feed water.

The low-pressure drums of the turbines are 11 ft. in diameter, by 8½ ft. long and 2½ in. thick. There were about 1,115,000 blades in these turbines, those in the low-pressure units being bound together by two circumferential strips, and an expansion joint has been used to prevent any buckling of the blades. Great care was taken to have all the rotating parts well balanced, and the very smooth action of the vessel, without a trace of vibration, is proof of the success of this part of the work.

The entire operation of the engines is controlled from a little platform at one end of the engine room, from which a full view of the room can be had. In normal working conditions the regulating valves admit steam to the high-pressure turbine, and the steam passes through it to the low-pressure turbines, and thence to the condenser. For manœuvring purposes, a large non-return valve, worked by a steam and hydraulic engine, controlled from the starting platform, closes the connection between the high-pressure and each low-pressure turbine; this valve is semi-automatic, inasmuch that, if not closed before manœuvring, it will close as soon as a prescribed pressure is attained in the low-pressure casing; each of the low-pressure turbines is then manipulated as an independent unit. Special manœuvring-valves are fitted to each of the combined low-pressure and astern turbines, and operated by steam cylinders, which allow of steam being admitted to either the ahead or astern turbines by a single movement of a hand-lever.

The electric generating plant has four 75-kw. units. There are sixteen lighting circuits from the main switchboard, ten for the air-tempering and ventilating apparatus, three for electric heaters, three for the turbine-lifting gear in the engine room, two for boat hoists, one for the galley machinery and one for the search-light projector.

There are eignt decks on both Caronia and Carmania. Below the boat deck they are lettered, for the sake of convenience, from A to G. On the A deck is situated the magnificent smoking room, paneled in oak, relieved with masses of old gold. On this same deck is found the combined writing and drawing-room, the tables being covered with red leather, the lamps over each table being furnished with shades of the same hue. Many of the choicest of the staterooms are located on this, the upper promenade deck. A number of them are en suite with bathroom, while the more pretentious ones consist of bedroom, parlor, bathroom and toilet room, and are in appointment and finish the equal of any room ever seen on ocean steamships.

On the boat deck is found an absolutely new feature in marine appointments. This is designated a "Lounge" or "Palm Room" in which coffee and light refreshments may be served from a buffet, and the gentlemen may be joined by the ladies while enjoying their after-dinner cigars.

The principal feature of deck C, the so-called saloon deck, is the magnificent first cabin dining saloon, extending the full width of the ship, just about midships, and capable of seating 300 passengers at one time. Upon the same deck with the first cabin dining-room is the large and comfortable second-cabin dining-room. This also extends across the entire width of the ship, insuring both light and ventilation from the large square ports. Immediately over this room, on the deck above, are the second-cabin drawing and smoking-rooms, provided with every comfort found in the first-class apartments, but different only in the degree of their luxuriousness.

No ships afloat have such satisfactory sanitary and commodious third-class accommodations as the Caronia and Carmania. Individual staterooms are provided for 2,000 persons so that the passengers may enjoy the privacy only secured formerly by passengers who paid the higher rates. There are two, four and six-berth rooms, the latter being for families.

The third-class dining hall is a light and airy apartment also running the full width of the ship paneled in sycamore, which will seat 560 persons at one time.

All important apparatus making for the safety of a ship at sea has been provided in Caronia and Carmania. They are equipped with the Stone-Lloyd system of water-tight doors, which are a part of the heavy steel plate partitions, dividing the ships into twelve separate compartments. These doors can be instantly closed by clever hydraulic mechanism operated from the bridge, and, in case of an accident, the ships would instantaneously be rendered non-sinkable.

The latest safety device to be incorporated in the Carmania and other Cunard ships is the new system of submarine signaling. By it signals can be transmitted under water between steamships and light vessels or from ship to shore. These signals work perfectly in cases of fogs when visual signals are useless. Many lightships are being equipped with submarine bells, and in thick or foggy weather these sound continually the known signal of this particular vessel. Approaching steamships provided with this apparatus are enabled to ascertain their exact location at all times and under all conditions. The sound of the bell, as heard on the steamship, indicates its direction and—by the intensity—its approximate distance, water being a constant medium.

An important installation is the refrigerating machinery and cold-storage. This is one of the largest plants ever placed on board ship. The 13,600 tons of dead weight cargo which Caronia and Carmania each carry is all handled easily and quickly by the sixteen steam winches. There are, in addition, two electrically driven winches on the boat deck for handling the life boats.

THE IRON AND STEEL INDUSTRY.

The condition of the iron and steel industry for the week ending Dec. 13 has been summarized by the "Iron Age" as follows: "The Lake Superior ore market has furnished in the last week one of the most remarkable developments of this record-breaking year. At the end of the first week in December, with cargoes of 1905 ore still coming down the lakes, it was authoritatively estimated that nearly 90 per cent of the merchant ores to be mined for 1906 has been sold. Careful computation also shows that, counting in the ore of consumers having their own mines and of consumers receiving ore on long time contracts, there has now been placed 95 to 96 per cent of all the lake ore available for next year. The eagerness of buyers has taken sellers by surprise. Nearly complete returns from the shipping ports show that the water shipments this year aggregated 33,473,761 tons. Adding all rail shipments, this indicates total shipments for the current year of 34,100,000 gross tons, a record output, which compares with the maximum of 27,571,121 gross tons in 1902 and an average of 23,500,000 tons for the last four years. Pig iron production is now on the basis of over 25,000,000 tons per annum. Our statistics for the month of November show that for that short month the production of anthracite and coke iron amounted to 2,012,004 gross tons, against 2,053,174 tons in October, a month of thirty-one days. Adding as a conservative estimate a monthly production of 30,000 tons of charcoal iron, the annual rate given above is reached. In November the steel companies contributed 1,334,644 tons of this total. The event of the week in the announcement that the Cambria Steel Company has purchased 60,000 tons of Bessemer pig for forward delivery, on the basis of monthly average prices. While the Steel Corporation has not yet bought its requirements for the first quarter, it is understood that the metal will be available. So far as can be learned, there is no truth in the cabled reports from England of purchases there for American account of 25,000 tons of Bessemer pig for consumption here. The only steel maker in this country likely to handle such a quantity denies such a transaction, which, too, is unlikely, because the prices abroad are above the parity here. The report was regarded as a full canard. A feature of the situation in manganiferous material is the purchase by the Steel Corporation of between 25,000 and 30,000 tons of spiegeleisen. The ferromanganese market shows annoying variations in prices.

PERSONAL NOTES.

Mr. Isham Randolph has been reappointed chief engineer of the Sanitary Drainage District of Chicago.

Mr. B. F. McClaid has been reappointed city engineer of Hopkinsville, Ky.

Capt. James H. Wilkerson has resigned the office of city engineer of Bowling Green, Ky., which he has held since 1882.

Mr. Paul Hansen has been appointed assistant engineer of the Ohio State Board of Health, of which Mr. R. Winthrop Pratt is chief engineer.

Mr. John C. McMynn, of Chicago, has been retained by the city of Milwaukee for advice concerning certain features of the proposed municipal electric lighting plant.

Mr. Edward A. Miller has been appointed chief engineer of the Department of Parks of the Boroughs of Manhattan and Richmond, New York City.

The report comes from Chicago that Mr. W. L. Darling, recently appointed chief engineer of the Pacific Railway Co., and Mr. E. J. Pearson, chief engineer of the Northern Pacific Ry., have changed places.

Mr. H. S. Hackbusch, of Coalgate, Ind., has been engaged by New York, Chicago and St. Louis parties as chief engineer of a railroad from Davis to Coalgate or Lehigh.

Mr. Richard C. Huston, of Laurel, Miss., has been appointed city engineer of Hattiesburg, Miss., where a resurvey of the town, a new official map and public improvements costing $200,000 are contemplated.

Mr. Ernest E. Howard, resident engineer of the Sixth St. viaduct under construction, over the Kaw river at Kansas City, Mo., gave an informal smoker in the air chamber of the caisson of one of the piers on Dec. 9. The guests assembled in a room 40 ft. below the river surface.

Mr. John F. Stevens, chief engineer of the Isthmian Canal Commission, is understood to have sailed from Colon on Wednesday in order to confer with the commission concerning the type of canal to be built. On his return Governor Magoon will come north for a short time.

Nathaniel P. Hobart, who died at Pottstown, Pa., on Dec. 7 at an advanced age, was formerly well known as a railway engineer. He was connected with the Philadelphia & Reading Ry. for many years and was an assistant to Richard Osborne on the construction of the Camden & Atlantic R. R.

Mr. Q. H. Crittendent has been placed in charge of the engineering work of the International & Great Northern R. R., with offices at Palestine, Tex., and the title of resident engineer. He succeeds Mr. J. D. Trammel, chief engineer, who has been given an indefinite leave of absence owing to sickness in his family.

Mr. Robert T. Lozier has been appointed district sales manager of the gas machinery department of the Power & Mining Machinery Co., with headquarters at 52 William St., New York. He will handle the American Crossley engines, American Crossley producers and Loomis-Pettibone gas generators.

President Henry S. Pritchett, of the Massachusetts Institute of Technology, has resigned his connection with the college, which will take effect at a time to be determined by the trustees. He is president of the Carnegie Foundation, and desires to move to New York so as to give all his time to that work.

A number of the leading architects of the country have appointed a committee to report on a national school of architecture. The chairman is Mr. Walter Cook, of Babb, Cook & Willard, and the other members are Prof. D. Despradelles, of the Massachusetts Institute of Technology; Mr. B. P. Trowbridge, of Trowbridge & Livingston; Mr. John M. Carrere, of Carrere & Hastings, and Mr. Lloyd Warren, of Warren & Wetmore. Mr. Whitney Warren, president of the Society of Beaux Arts Architects, is an ex-officio member of the committee. It is hoped that a report can be prepared by February.

Edward Atkinson, the leading spirit for many years in mutual insurance for manufacturing companies, died at Boston on Dec. 11 aged 78 years. He was a man of extraordinary versatility, and although his school days closed when he was fifteen years old, his attainments brought him a Ph.D. from Dartmouth College and a LL.D. from the University of South Carolina, the latter in recognition of his great influence in attracting capital to the development of the natural resources of the South. He was deeply interested in engineering problems and was one of the founders of the Massachusetts Institute of Technology.

Mr. John D. Isaacs has been appointed consulting engineer of the completed lines of the Union Pacific, Southern Pacific, Oregon Short Line and Oregon Railroad & Navigation Co. His offices will be at San Francisco. He was graduated from the University of Virginia in 1869 and entered railway service as a draftsman with the Southern Pacific Co. in 1875. He has the unique distinction of having passed his entire professional career with a single company. He rose through the grades of chief draftsman, assistant superintendent of bridges and buildings, acting superintendent of the same department, second assistant engineer and assistant engineer of maintenance of way and engineer of bridges.

The following nominations of officers of the American Society of Civil Engineers have been made by the nominating committee of that body: President, Frederic P. Stearns, chief engineer Metropolitan Water & Sewerage Board, Boston. Vice-presidents, Onward Bates, president Bates & Rogers Construction Co., Chicago; Bernard R. Green, superintendent of building and grounds, Library of Congress, Washington. Treasurer, Joseph M. Knap, New York. Directors—J. Waldo Smith, chief engineer Board of Water Supply, New York; Geo. Gibbs, first vice-president Westinghouse, Church, Kerr & Co., New York; Emil Swensson, consulting engineer, Pittsburg; James M. Johnson, president Louisville Bridge & Iron Co.; Wynkoop Kiersted, consulting engineer, Kansas City; Wm. B. Storey, Jr., chief engineer Atchison, Topeka & Santa Fe Ry., Topeka. The election will take place Jan. 17.

At the annual meeting of the Association of American Portland Cement Manufacturers in New York this week, the following officers were chosen: President, John B. Lober, president of the Vulcanite Portland Cement Co.; vice-president Chrales F. Wade, secretary, treasurer and manager of the Omega Portland Cement Co.; treasurer, Ernest Ackerman, president of the Lawrence Cement Co. Executive Committee—Robert W. Lesley, president of the American Cement Co.; Edward M. Hagar, manager of the cement department of the Illinois Steel Co.; Thomas J. Brady, president of the Coplay Cement Manufacturing Co.; Deuane Millen, vice-president of the Thomas Millen Co.; A. F. Gerstell, vice-president of the Alpha Portland Cement Co., and the recent purchaser of the plant of the National Portland Cement Co.; E. M. Young, treasurer of the Lehigh Portland Cement Co.; W. R. Warren, president of the Virginia Portand Cement Co.; Wm. H. Harding, president of the Bonneville Portland Cement Co.; S. B. Newberry, manager of the Sandusky Portland Cement Co.; T. Henry Dumary president of the Helderberg Cement Co.; Conrad Miller, president of the Dexter Portland Cement Co., and D. McCool, president of the Newaygo Portland Cement Co. At the annual banquet of the association at the Hotel Astor on Tuesday night Mr. Lober was presented with a beautiful silver service. The presentation was made by Mr. Lesley, the first president of the association, who expressed the appreciation by the memoers of the tact and fairness with which Mr. Lober had met all the difficult executive problems of a society formed of business competitors, and had strengthened the association's influence in the industry it represents. He was followed by Hon. T. J. Brady, who presented Mr. Lober with a handsomely bound volume containing letters from the companies in the association, received while arranging for the service of silver. He dwelt particularly in his remarks on the great good accomplished by the association in bringing together men who would otherwise know each other only as business rivals, and expressed the members' thanks for Mr. Lober's work to this end. Another feature of the evening was the happy manner in which the retiring vice-president, Mr. Gerstell, stated his satisfaction at giving place to Mr. Wade, thereby placing Omega ahead of Alpha, for by so doing added prestige was given in the association to the numerous Michigan companies.

F. A. MOLITOR.

The appointment of Mr. F. A. Molitor, of St. Louis, as supervising engineer for the Philippine Commission of the railways to be built in the islands, was briefly announced last week. Mr. Molitor was born in 1862 and was graduated from Cornell University., From 1886 to 1888 he was rodman, instrumentman and draftsman with the Central R. R. of New Jersey, resigning to become assistant engineer on the New York extension of the Baltimore & Ohio R. R. He then served about a year as assistant and principal assistant engineer on the Kentucky Central R. R. in direct charge of construction under Mr. E. Randolph, chief engineer. During this time he renewed the substructure and superstructure of five bridges and built shops costing $125,000. In 1890 he was engineer of maintenance of way of the Cincinnati division of the Chesapeake & Ohio R. R., and roadmaster of the Richmond, Nicolsville & Beattyville R. R. in southern Kentucky. For the next three years he was on the Philadelphia & Reading R. R. in charge of terminal and harbor work, comprising the design and direction of alterations of a coal shipping plant at Port Richmond, and was also in charge during part of this time of the construction work of the Philadelphia Belt Line R. R. In 1894-95 he was in charge of the Montauk extension of the Long Island R. R., locating and building 22 miles of road. In 1896 he was appointed engineer of maintenance of way of the Choctaw, Oklahoma & Gulf R. R. and later chief engineer, resigning last year to become chief engineer and general manager of the Midland Valley R. R. Co. On the completion of the organization of the latter company he resigned the general managership. Both companies were organized by a Philadelphia syndicate and have built about 1,300 miles of railroad in Arkansas, Texas, Oklahoma and Indian Territory. In a large part of the work on which Mr. Molitor was engaged he was in direct charge of construction, no contractor being employed or else the contract was let to a subsidiary company of the main railway company. Consequently he has had an exceptional experience as a railroad builder as well as engineer and his selection for the Philippine office was a happy choice.

Mr. Calvin W. Hendrick, chief engineer of the Baltimore Sewerage Commission, has announced a number of appointments to the leading positions on his staff. The first assistant engineer is Mr. Albert M. Broscius, recently an assistant under Mr. Hendrick on the work of the New York Rapid Transit Commission. He was assistant commissioner in charge of sewers in Baltimore during a previous administration and later was on the staff of Mr. Alexander Potter on the construction of the joint outfall sewer in northern New Jersey. The division engineer in charge of the disposal plant is Mr. Ezra B. Whitman, who was born in Baltimore, and served on the engineering staff of the United Railways & Electric Co. soon after his graduation from Cornell University. Afterward he made a study of sewage disposal in England and has since been engaged in the design of disposal works, of late as a partner in the firm of Williams & Whitman, of New York. The division engineer in charge of the low-level sewerage works is Mr. Kenneth Allen, well known to many readers of this journal through his previous connection with the Baltimore sewerage works as engineer of the commission of which Mr. Mendes Cohen was chairman. He has been chief engineer and superintendent of the Atlantic City water-works department for a number of years past, and several interesting pieces of work done there under his direction have been described in this journal during the last year or so. The division engineer in charge of the high-level sewers is Mr. Oliver W. Connet, at present assistant city engineer of Baltimore, in charge of sewers. The assistant engineer in charge of the central office is Mr. Herbert W. Knight. From 1896 to 1899 he was connected with the sewerage department of the city engineer's office in Providence, and since that time has been associated with the Continental Compressed Air Power Co. as local manager at Norwich, Conn. Mr. Frank T. Daniels, engineer of the drafting office, has long been connected with the designing department of the Metropolitan Water and Sewerage Board, and is now principal assistant engineer under Mr. Stearns. These appointments take effect on the first of next year.

BUSINESS NOTES.

The Charlotte Pipe & Foundry Co., Charlotte, N. C., manufacturers of cast-iron soil pipe and fittings, and castings for the plumbing trade, have recently equipped for the manufacture of cast-iron water and gas pipe, sewer manhole covers, and other castings in connection with the water works and sewer trade; they are at the present time making the smaller sizes. This concern started in the business some four or five years ago with a very small plant, which has been continually developed until its capacity has been increased several times over the original output.

The Northern Engineering Works, Detroit, Mich., have been awarded the contract for the electric cranes required in the new steel casting foundry of the Monarch Coupler Co., Ltd., of Detroit. There will be one 25-ton, four-motor electric ladle crane of 50 ft. span and one 10-ton, four-motor standard crane of 50 ft. span. The Northern Engineering Works have also recently completed installing three electric traveling cranes in the plant of the Detroit Steel Casting Co., consisting of one 30-ton, four-motor ladle crane, 70-ft. span, and two 10-ton, three-motor electric cranes, 70-ft. span, and are now constructing for the same firm a 10-ton, 80-ft. electric gantry for yard service.

The Howard Iron Works, of Buffalo, have been reorganized and their capital increased. The following officers and directors have been elected: H. S. Madden, president, also president of the Sherwood Mfg. Co.; R. W. Gardner, vice-president and secretary, also president of the Gardner Elevator Co., of Detroit; F. S. Porter, treasurer; Hon. H. L. Lewis, O. N. Gardner, G. H. Gardner. With increased capital the Howard Iron Works will be in a position to largely increase its business and make further improvements and enlargement of its plant. Special attention will be given to elevator work for both passenger and freight service; transmission machinery, bolt and nut making machinery, and jobbing work.

The Indiana Road Machine Co., of Fort Wayne, Ind., has recently acquired possession of the business of the National Drill & Manufacturing Co. relating to the National reversible road machine, elevating grader, dump wagon, rock crusher and accessories and road roller. These goods, with repair parts for same, will hereafter be manufactured and marketed by the Indiana company in connection with its own line, thus enabling it to offer to the trade a large and most complete line of road-making and earth-handling machinery.

A structural steel engine house 100 x 50 ft. and 50 ft. high, with crane runway, will be built by the Cherry Valley Iron Co., at West Middlesex, Pa. The contract for the construction and erection of the building has been awarded to Wm. B. Scaife & Sons Co., Pittsburg, Pa.

U. S. Consul-General Dickinson, of Constantinople, reports that the order for the building of the new Galata bridge across the Golden Horn, for which American firms were active bidders, has been secured by the firm of Schneider & Co., owners of the Creusot Works in France. The contract, however, is held in suspense owing to a difference in regard to the cost of the bridge. In consideration of a recent loan obtained from France the Turkish Government agreed to appropriate the sum of $2,640,000 to pay for the new bridge, torpedo gun boats and armaments, and it was expressly stipulated in the agreement that these were to be ordered in France. Out of this appropriation $2,112,000 is to be expended in armaments and ships, leaving a balance of $528,000 to pay for the Galata bridge. The French engineers had practically closed the contract at this figure, when, upon further examination, they found that it would be impossible to build the bridge at that price. They are willing to do the work for an extra $76,000, and the Imperial government has accepted this extra allowance, but refuses to have it taken out of the loan or furnish security for its payment.

The Westinghouse Electric & Mfg. Co. is doing a large business in equipping mines with electrical locomotives, to replace the older forms of haulage, whether animal or mechanical. A recent contract closed by the company is one with the Newport Mining Co., which has decided to equip its mines at Ironton, Mich., with both surface and underground electric haulage. It will use electric locomotives the year around in the various underground levels for bringing the ore to the bottom of the shaft, and after the transportation season has closed will use electric locomotives on the surface for hauling ore from the top of the shaft to the various stock piles for storage. For these purposes they have ordered six 4-ton Westinghouse mine locomotives. Electrical apparatus for the equipment of the necessary power station will also be provided by the Westinghouse Co., consisting of a 150-kw., 250-volt generator, direct-connected to a Corliss engine of 130 r.p.m., and a three panel switchboard, besides other auxiliary apparatus.

Among the contracts for staggered-pipe economizers recently closed by the B. F. Sturtevant Co., Boston, Mass, may be mentioned orders from the Singer Mfg. Co., Elizabethport, N. J., and the Hollingsworth & Vose Co., West Groton, Mass. The Sturtevant Co. has also closed contracts recently for electric generating sets for W. D. Byrn & Sons, Mercersburg, Pa.; Charles E. King, Brooklyn, N. Y., and the Old Colony Street R. R. Co., Quincy Point, Mass.

TRADE PUBLICATIONS.

The general catalogue of the Rensselaer Mfg. Co., of Troy, N. Y., has been recently revised and now appears as a book of 184 pages. It lists a great variety of air, ammonia, oil, steam and water valves, gates, hydrants and accessories for every kind of piping, the list of types being so great as to require a three-page index. The dimensions are given in unusually full detail, and there are descriptive notes of all the designs for special purposes.

Heavy-duty steam hoisting engines are described very fully in catalogue 058 of the C. W. Hunt Co., West New Brighton, N. Y. This explanation not only relates to the design of the engine but also to the method of manufacture, which is unusually interesting. The engine is made with single, double and triple drums, and in various combinations, several of which are illustrated.

The Watson-Stillman Co., 46 Dey St., New York, has issued leaflets concerning three types of coupling-bolt forcers. These were designed originally, it is understood, for forcing in or out the coupling bolts on steamship shafts, and their ingenious form shows that a wide variety of applications can be made of hydraulic rams by a specialist in their design.

The Montgomerie-Neilson system of sewage disposal is described in a pamphlet issued by the Sanitary Biological Co. of Florence, Italy. It employs a septic tank divided into two portions, in one of which the sewage is in free contact with the outside air while in the other it is deprived of air. The system has been tried practically in Florence, where it is said to be working satisfactorily.

CONTRACTING NEWS
OF SPECIAL INTEREST TO CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

**Bessemer, Ala.*—Mayor J. C. Vines is reported to have contracted with Adler & Co., whereby a system of water works is to be built in that town within 6 months.

Montgomery, Ala.—Bids will be received until Dec. 22 by R. S. Williams, City Treas., for furnishing and installing steam piping for City Water Works station; also constructing a covered concrete reservoir, together with the necessary 20-in. pipe connections for said water works.

Osceola, Ark.—Bids will be received until Jan. 10 by the Bd. Improv., for constructing a system of water works, as advertised in The Engineering Record.

Los Angeles, Cal.—Frank M. Porter, an attorney, is reported to have purchased a franchise for a system of water works, to extend toward Hollywood, from Los Angeles.

San Quentin, Cal.—Bids will be received until Dec. 22 by the State Bd. Prison Dirs. (Robt. T. Devlin, Pres.), 331 Pine St., San Francisco, for furnishing wrought-iron pipe and fittings, c. i. pipe, lead, steel, blasting machine, cement testing apparatus, hoisting engine, sand, cement, tools, etc., to be delivered during the year 1906.

Denver, Colo.—The Agricultural Ditch Co., Chamber of Commerce Bldg., is reported to be considering the construction of a reservoir about 8 miles southwest of Denver, near Bancroft ranch probable cost of work proposed, $75,000.

**Sterling, Colo.*—C. S. Sheeley, of Denver, is reported to have secured the contract for relaying the main pipe line, for $49,558.

**Ft. Screven, Ga.*—Capt. Jos. T. Davidson, Q. M., U. S. A., writes that the contract for enlarging pump house and installing boiler and pump at this post (bids opened Nov. 27) has been awarded to Hurley & Co., of St. Paul, Minn.

Rochelle, Ill.—Bids will be received by Thos. M. Keegan, City Clk., until Jan. 2, for the construction of a deep well, as advertised in The Engineering Record.

**Chicago, Ill.*—The Henry R. Worthington Co., of New York, N. Y., and the Neptune Meter Co., New York, N. Y., are reported to have secured contracts for furnishing this city with water works.

Bids will be received until Dec. 21 by the Dept. Pub. Wks. (Jos. M. Patterson, Comr.) for furnishing and delivering at the water works shops, 22d St. and Ashland Ave., all the hydrant and stop-valve castings that may be required and ordered during the term ending Dec. 31, 1906; also same date for furnishing and delivering at the various pipe yards of said dept., all the c. i. rings and covers for hydrant chambers that may be required during the term ending Dec. 31, 1906. Bids will also be received until Dec. 29 for furnishing and erecting in the boiler room of the 68th St. pumping station 4 horizontal water tube boilers, fitted with chain grate stokers and necessary appurtenances; also until Dec. 30 for furnishing labor and material to construct a Portland cement concrete-lined water tunnel about 22,700 ft. long, including certain shafts, said tunnel being Sec. No. 1, Southwest Land Tunnel.

Andrews, Ind.—See "Power Plants, Gas and Electricity."

Frankfort, Ind.—The City Council is reported to have under consideration the question of constructing water works.

Sioux City, Ia.—The Council has passed a resolution providing for the construction of a conduit to convey the water in Bacon Creek in Grand St., from Rustin Ave. to Missouri River.

Smithland, Ky.—The Eberman Water Co. (Harry Eberman, Pres.) is reported to have secured a franchise for water works.

Havre de Grace, Md.—The matter of issuing water works bonds is reported under consideration here.

Westfield, Mass.—The citizens are reported to have voted Dec. 5 to increase the water supply, by taking water from Little River.

Crosswell, Mich.—See "Power Plants, Gas and Electricity."

Negaunee, Mich.—This city is reported to be considering the installation of water meters. About 1,000 will be necessary. Edw. Anthony, Pres. Bd. Pub. Wks.

St. Clair Heights, Mich.—Bonds to the amount of $37,000 are reported sold, to be used for the construction of water works and a sewerage system.

Vernon Center, Minn.—Plans and specifications are reported to have been prepared for the improvement of the water works.

Farmington, Minn.—See "Power Plants, Gas and Electricity."

Macon, Miss.—Bids will be received by H. L. J. Barnes, City Clk., until Jan. 9, for furnishing material and erecting a tank and tower, a filter plant, a clear water basin and a raw water basin, as advertised in The Engineering Record.

Perth Amboy, N. J.—Bids will be received by the Bd. of Water Comrs. until Dec. 27 for furnishing material and constructing complete a 25-ft. suction well at Runyon, N. J., as advertised in The Engineering Record.

Bayonne, N. J.—F. W. Dalrymple, City Engr., is reported to have been instructed to prepare plans for a 16-in. water main, to supply the industries at the Hook.

Gallup, N. M.—F. W. Meyers, Town Clk., writes that the citizens voted Dec. 5 to issue $10,000 bonds for a water supply.

Silver City, N. M.—The Silver City Valley Water Works Co. is reported incorporated by W. D. Murray, Thos. L. Lowe and others, of Silver City. Capital, $90,000.

New York, N. Y.—The Bd. of Estimate on Dec. 8 authorized an issue of corporate stock in the sum of $1,000,000 for the water supply.

Bids will be received until Dec. 27 by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and setting double nozzle standard New York hydrants.

Bids will be received until Dec. 22 (readvertisement) by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying high-pressure fire service mains and appurtenances in numerous streets, Boro. Manhattan. The time allowed for doing and completing the entire work is 350 working days; the security required for the entire work is $300,000.

Dunkirk, N. Y.—W. C. Baumgartner, Secy. Bd. Water Comrs., writes that about $8,000 to $10,000 will probably be expended for extension of 20-in. water main, new engine and new arc lamps. Matter will be taken up in the spring.

Brooklyn, N. Y.—Bids will be received until Dec. 27 (extension of date) by John T. Oakley, Comr. Water Supply, Gas and Electricity, New York City, for furnishing and delivering c. i. flanged pipe, special castings, etc.; also furnishing and erecting a wrought-iron fence, with gates, at the Mt. Prospect Reservoir, all in Boro. Brooklyn. Bids will be received same time and place for furnishing and delivering c.i. stop-cock boxes and covers.

**Buffalo, N. Y.*—The following are reported to be the bids opened on Dec. 6 by Francis G. Ward, Comr. Pub. Wks., for a tunnel for water pipes under Buffalo River, near Ohio St.: (*a*) for tunnel (*b*) per lin. ft. extra for lining: J. W. Dwyer & Sons, *a* $17,900, *b* $30; Miller & Franklin, *a* $20,900, lined with brick or concrete; Rappich & Culliton, *a* $18,900, *b* $15; Jos. F. Stabell, *a* $23,675, including lining; Buffalo Dredging Co., *a* $13,900, *b* $20 (recommended for award).

The Water Comrs. have recommended that the contract for furnishing a 30-ton electric traveling crane for the pumping station (bids opened Dec. 1) be awarded to the Northern Eng. Works, of Detroit, Mich., for $10,050.

**Wilmington, N. C.*—The Clarendon Water Wks. Co. is reported to have awarded to the Pittsburg Filtration Co., of Pittsburg, Pa., the contract for installing a mechanical filtration plant, for about $25,000.

The Bd. of Aldermen is stated to have purchased the Greenfield Mill Pond property, as a source of water supply for the proposed municipal water works.

Ft. Lincoln, N. D.—Lieut. Col. J. E. Sawyer, Q. M., U. S. A., St. Paul, Minn., writes that new bids will be received until Jan. 11 for laying an 8-in. water main at Ft. Lincoln. According to press reports this main will connect with the water supply of Bismarck, a distance of about 3 miles.

Niles, O.—See "Power Plants, Gas and Electricity."

Cleveland, O.—Specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for a 200,000-gal. steel water tower for the water works division of the Dept. of Pub. Service, bids for which will be opened on Dec. 20.

Carrollton, O.—This city is reported to be considering the question of obtaining an increased water supply.

Oklahoma City, Okla.—The City Council is reported to have instructed City Engr. Burke to proceed with the work preliminary to the improvement of the water works. The citizens recently voted to issue $450,000 bonds for improvements to the water works and sewerage system.

Perry, Okla.—F. F. Busch, City Clk., writes that an election will be held Jan. 30 to vote on issuing $25,000 bonds for water works improvements.

McMinnville, Ore.—See "Power Plants, Gas and Electricity."

Eugene, Ore.—Rhoades, Sinkler & Butcher are reported to have purchased the water works, and will construct a reservoir, additional wells and filters.

**Portland, Ore.*—The U. S. Cast Iron Pipe & Fdy. Co., of Chicago, Ill., has secured the contract for 4,195 tons of c.-i. pipe at $35.75 per ton and 166,000 lbs. special castings at 3 cts. per lb., bids opened Nov. 27 by the Water Bd. (D. D. Clarke, Engr.). The R. D. Wood Co., of Philadelphia, Pa., bid for 2,060 tons $35.65 per ton and 2,125 tons at $36.15 per ton, and for the special castings 3 cts per lb. The Risdon Iron & Loc. Wks., of San Francisco, submitted the following detail bid for the above, using riveted steel pipe: 31,600 lin. ft. 24-in. steel pipe, ¼-in. plate, $3.90; 65 manholes, ea., $16.50; 9 blow-offs (valves furnished by Water Bd.), $11; setting 6 air valves, $11; 64 saddles for crosses and tees, $10; 400 lin. ft. 24-in. steel riveted pipe (curved to 5 ft. radius), $3.85; 2,000 lin. ft. 6-in. blow-off pipe, 49 cts.; 50 cu. yds. concrete foundation for specials, $6; 2 acres clearing and grubbing, $40; 30,000 cu. yds. earth excav., refill trenches, 36 cts.

**Ft. Stevens, Ore.*—The following are the bids opened on Nov. 7 by Maj. F. G. Hodgson, Ch. Q. M., U. S. A., Vancouver Barracks, Wash., for erecting a 150,000-gal. steel tank on a 75-ft. trestle at Ft. Stevens: Portland Steel Shipbuilding Co., $13,368; Puget Sound Bridge & Dredging Co. (2 bids), $13,400 and $15,215; St. Paul Fdy. Co., $15,922; Minneapolis Steel & Mchy Co., $14,730; Contracting Eng'g Co., $15,000; Ferguson & Houston (2 bids), $14,900 and $14,000; Des Moines Bridge & Iron Wks., $14,486; International Contract Co., 737 N. Y. Block, Seattle, Wash., $13,125 (awarded contract), and Robt. L. Hamill Co., $11,000.

Elgin, Ore.—The City Council is reported to be preparing plans for improving the water works.

Philadelphia, Pa.—See "Paving and Roadmaking."

Birdsboro, Pa.—The Birdsboro Water Co. is reported to have decided to construct an additional pipe line, 16-in. diam., and will replace the 4-in. pipe with 6 in. A pumping station will also be erected at Hampton furnace dam.

Edgefield, S. C.—See "Power Plants, Gas and Electricity."

Dallas, Tex.—The City Council is reported to have voted to purchase the Oak Cliff water works at a cost of $30,000.

Beaumont, Tex.—The question of issuing bonds to establish municipal water works is reported under consideration.

Provo, Utah.—See "Power Plants, Gas and Electricity."

** Items marked thus give the names of parties awarded contracts.*

Sunnyside, Wash.—Wm. B. Bridgman, Mayor, writes that it was voted Dec. 5 to construct water works.

Bellingham, Wash.—The Water Bd. is reported to have adopted plans for the construction of a new pipe line, penstock and turbine water wheel for the Whatcom Falls property owned by the city.

Rosalia, Wash.—The citizens are reported to have voted Dec. 5 to issue $18,000 bonds for water works.

Tacoma, Wash.—A gravity system of water works is proposed, requiring a pipe line 45 miles in length, to cost about $1,500,000. Frank L. Davis, City Engr.

**Seattle, Wash.*—The International Contract Co., 738 New York Block, has secured the contract for water mains, including gates and hydrants, on E. Prospect and other streets (bids opened Dec. 2) for $21,029. It bid for 1,220 lin. ft. 10-in. c.-i. pipe, $1.70; 11,380 lin. ft. 8-in., $1.27, and 611 ft. 6-in., 95 cts. The other bidders were Stirrat & Goetz, Bailey Bldg., $21,177, and Bell & Price, Marion Bldg., $22,497.

Piedmont, W. Va.—H. B. Carroll, Pres. Piedmont Water Works Co., writes that bids are wanted until Jan. 2 for the construction of a gravity system of water works; probable cost reported to be about $30,000.

Monroe, Wis.—Engineer W. W. Churchill, in his report to Willis Ludlow, Mayor, estimates the cost of constructing municipal water works at $65,000.

Peterboro, Ont.—It is reported that this city will expend $15,000 on the water works, $3,385 on sewers and $13,924 for granolithic sidewalks.

Guelph, Ont.—Allen Hazen, of New York, N. Y., is reported to have submitted a report on the water supply. He estimates the cost of a sand filter at $61,150 and a mechanical filter, at $48,500.

Goderich, Ont.—The question of improving the water works is reported under consideration here.

Chihuahua, Mex.—Bids will be received until Jan. 15 by Victor Esperon, Secy. Com. on Improv. at the Municipal Palace, Hidalgo del Parral, Chihuahua, Mex., for furnishing material and constructing a system of sewerage and hydraulic works for the sanitation and water supply of the city. Bids on the material and labor are to be submitted separately, and also on the following: Iron pipe and fittings; vitrified clay pipe and fittings; valves and their cases; Portland cement; lime; work of excav. and laying iron pipe; work of excav. and laying clay pipes; masonry work; fire hydrants; construction of stone and mortar dam cement lines according to specifications.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Van Buren, Ark.—Jas. M. Clark, City Engr. of Nevada, Mo., writes that a new sewerage system is contemplated for Van Buren, but no definite steps have been taken as yet; probable cost $13,000.

Denver, Colo.—We are informed in regard to the construction of sewers in Montclair and Capital Hill, that the construction of a sanitary main, sub-mains and a portion of laterals for 5,400 acres is being considered for early construction, by the Bd. of Pub. Wks. The materials to be used will be brick and vitrified pipe.

Washington, D. C.—Bids will be received until Jan. 15 for constructing about 9,500 ft. of trunk sewer 8-ft. 4-in. by 9-ft. 4-in., the same being a portion of the sewage disposal system outfall sewer, in the Dist. of Columbia, as advertised in The Engineering Record.

Douglas, Ga.—The City Council is reported to have selected Capt. C. C. Anderson, of Macon, to have charge of constructing a sewerage system for Douglas.

Atlanta, Ga.—The Council is reported to have passed ordinances, providing for extensions of the Butler St. sewer and the Tan Yard branch sewer.

Savannah, Ga.—Estimates have been prepared jointly by the Director of Public Works, and J. W. Howard, Asst. City Engr., for constructing storm sewers for the relief of Bilbo Canal and to take away the strain now experienced at Bolton and E. Broad St. Four plans are suggested and the estimated cost of each respectively is $28,996, $25,117, $10,490 and $14,092.

Chicago, Ill.—See "Power Plants, Gas and Electricity."

Sapulpa, Ind. Ter.—D. B. Merry, of Tulsa, is preparing plans for a sewerage system for Sapulpa.

Tulsa, Ind. Ter.—N. J. Gubser, City Recorder, writes that D. B. Merry and J. Gus Patton will be engineers in charge of the proposed sewers to be constructed at a cost of $46,000. No date yet decided upon for the receiving of bids.

Washington, Ia.—Bids will be received until Jan. 4 by John H. Steck, City Clk., for furnishing material and constructing an extension to the present brick storm sewer. The work consist of approximately 3,000 ft. of circular sewer, 36-in. interior diameter and 52-in. exterior diameter laid at a depth that averages about 7 ft. of excavation.

**Baton Rouge, La.*—R. Swart, City Engr., writes that the following are the bids opened on Nov. 30 for constructing a separate system of sewerage: (*a*) Guild & Co., Chattanooga, Tenn., $31,381 (awarded contract); (*b*) Robt. C. Storie, New Orleans, La., $39,757:

Pipe Sewers.	**a*	*b*
4,561 lin ft. 18-in., 16 to 18 ft. cut	$3.00	$3.00
190 lin. ft. 18-in., 18 to 20 ft. cut	3.40	3.25
720 lin. ft. 18-in., 20 to 24 ft. cut	3.75	4.50
495 lin. ft. 18-in., 24 to 28 ft. cut	4.50	5.25
755 lin. ft. 18-in., 28 ft. and over cut	4.75	5.50
50 lin ft. 10-in., 9 to 6 ft. cut	.45	.55
903 lin. ft. 10-in., 6 to 8 ft. cut	.50	.65
1,138 lin. ft. 10-in., 8 to 10 ft. cut	.65	.85
1,412 lin. ft. 10-in., 10 to 12 ft. cut	.80	1.25
780 lin. ft. 10-in., 12 to 14 ft. cut	1.10	1.50
940 lin. ft. 10-in., 14 to 16 ft. cut	1.50	1.90
420 lin. ft. 10-in., 16 to 18 ft. cut	1.85	2.25
11,650 lin. ft. 8-in., 0 to 6 ft.	.34	.45
9,845 lin. ft. 8-in., 6 to 8 ft	.39	.55
3,465 lin. ft. 8-in., 8 to 10 ft.	.55	.75
1,150 lin. ft. 8-in., 10 to 12 ft.	.65	1.10
75 manholes 8 ft deep	35.00	40.00
11 flushtanks—6-in. siphon	75.00	125.00
5-in. siphon	65.00	75.00
Concrete, per cu. yd.	9.00	12.00
202 lin. ft. manholes over 8 ft., per ft.	5.00	5.00
72 ft. drop in manholes, per ft.	.40	1.00

St. Clair Heights, Mich.—See "Water."

St. Paul, Minn.—Bids will be received until Dec. 21 by the Bd. Pub. Wks. (R. L. Gorman, Clk.) for constructing a sewer in a portion of Earl St.

**Gulfport, Miss.*—A. L. Patterson & Co., of Macon, Ga., are stated to have secured the contract for constructing Sect. A of the sewerage system (bids opened Nov. 22) for about $40,000.

***Kirkwood, Mo.*—Bids will be received until Dec. 21 by Thos. H. Sprinkle, Attorney, Room 417 Security Bldg., St. Louis, for constructing sanitary sewers in Kirkwood, as advertised in The Engineering Record.**

Alliance, Neb.—D. Waters, City Clk., writes that Blake & Lawrence, of St. Louis, Mo., are preparing plans for the construction of a sewerage system and bids will probably be called for in the spring.

Nebraska City, Neb.—The City Council is considering plans for extending the sewerage system west from 7th St. A. M. Munn, City Engr.

Trenton, N. J.—Bids will be received until Dec. 19 by the Common Council, for constructing a sewer in a portion of Decatur St. Harry B. Salter, City Clk.

Plainfield, N. J.—The Common Council is reported to have passed on first and second reading the ordinance appropriating $55,000 for the construction of a sewage pumping plant.

Waterford, N. Y.—See "Paving and Roadmaking."

Troy, N. Y.—Eugene H. Porter, State Health Comr., is reported to have recommended the construction of a sewage disposal plant for Troy. Jas. M. Riley, Clk. Bd. of Contract and Supply.

Long Island City, L. I., N. Y.—Bids will be received until Dec. 26 by Jos. Cassidy, Boro. Pres., for constructing sewers and appurtenances in 20th, 28th and 29th Sts., Whitestone, Boro. Queens. Engineer's estimate: 2,050 lin. ft. 12-in. vitr. salt glazed or cement concrete sewer pipe; 6,000 ft. B. M. timber for foundation, furnished and laid; 9,000 ft. B. M. timber for bracing and sheet piling; 16 manholes complete; 25 cu. yds. rock, excavated and removed.

Cleveland, O.—Bids will be received until Dec. 21 by the Bd. Pub. Service (A. R. Callow, Secy.) for constructing sewers in numerous streets.

Ravenna, O.—Bids will probably be called for about Feb. 18 for the construction of a sewerage system to include septic tanks and sand filters; probable cost, $100,000. Engineers, Williams & Whitman, New York, N. Y.

Napoleon, O.—It is reported that bids are wanted until Dec. 23 for constructing storm sewers in several streets. F. W. Hilgendorff, City Clk.

Chicago, Ill.—The following are the totals of bids opened on Dec. 5 for the construction of the 95th St. system of sewers, according to sections, from 1 to 5. (*a*) Sect. 1 for furnishing material and erecting pumping station at 95th St. and Erie Ave.; (*b*) Sect. 2 for furnishing and installing machinery in pumping station; (*c*) for c. i. discharge pipes, including outfall; (*d*) constructing concrete sewers from 95th to 89th St.; (*e*) constructing concrete sewers from 99th to 107th St.: Lorimer & Gallagher Co., *a* $49,000, *b* $78,000, *c* $67,500, *d* $496,261, *e* $249,094; Union Paving Co., *a* $49,000, *b* $69,000, *c* $58,500, *d* $509,269; *e* $231,131; R. F. Conway Co., *a* $50,000, *b* $45,000, *c* $75,000, *d* $469,307, *e* $241,573; Nash Bros., *a* $45,000, *b* $70,000, *c* $62,500, *d* $451,573, *e* $242,924.

The following are the bids received for Section 4 of the 95th St. system of sewers: (1) Lorimer & Gallagher; (2) Union Paving Co.; (3) R. F. Conway Co.; (4) Nash Bros. According to specifications the contractor shall for the price per lin. ft., furnish all material, tools, etc., and do all the work prescribed:

Concrete sewers—	(1)	(2)	(3)	(4)
75 lin. ft. 4-ft. suction infall sewer	$29.00	$22.00	$9.10	$25.00
150 lin. ft. 5-ft. suction infall sewer	29.00	22.00	11.70	30.00
500 lin. ft. 10½-ft. 95th St.	23.00	22.00	20.80	21.00
370 lin. ft. 9-ft., 95th St.	19.25	20.00	17.05	16.10
660 lin. ft. 9-ft., Commercial Ave.	20.25	20.00	20.04	16.10
2,650 lin. ft. 9-ft., Anthony Ave.	18.50	20.00	17.05	16.10
1,240 lin. ft. 8½-ft., Anthony Ave.	17.00	18.00	15.95	14.75
6,520 lin. ft. 8½-ft., 90th St.	16.45	18.00	15.95	14.75
5,300 lin. ft. 8-ft., 90th St.	16.00	16.40	15.82	14.00
1,340 lin. ft. 3-ft., Cottage Gr. Ave.	5.50	5.75	5.00	5.50
660 lin. ft. 5½-ft., Cottage Gr. Ave.	8.75	9.00	9.12	9.00
3,330 lin. ft., 6-ft., Cottage Gr. Ave.	9.40	9.75	9.62	9.75
3,990 lin. ft. 5½-ft., 95th St.	9.50	9.50	9.32	9.85
2,330 lin. ft. 5-ft., 95th St.	8.50	8.50	7.85	8.00
1,670 lin. ft. 4½-ft., 95th St.	7.50	7.00	6.70	6.60
1,330 lin. ft. 4-ft., 95th St.	7.00	6.50	5.68	6.25
2,000 lin. ft. 3½-ft., Wallace St.	6.45	6.00	5.50	5.40
1,330 lin. ft. 3-ft., Wallace St.	5.45	5.66	5.00	5.00
2,660 lin. ft. 5-ft., 89th St.	8.00	8.25	7.00	7.50
1,330 lin. ft. 4½-ft., 89th St.	7.25	6.80	6.30	6.00
595 lin. ft. 3½-ft., Marquette Ave.	7.50	6.00	7.32	5.48
1,400 lin. ft., 3½-ft., So Chicago Ave.	6.25	6.00	6.02	5.48
250 lin. ft. 3-ft., Saginaw Ave.	5.30	4.75	5.60	5.38
1,130 lin. ft. 3-ft., 89th St.	5.30	4.75	5.60	5.38
Totals	$496,261	$509,269	$469,308	$451,573

Cincinnati, O.—Bids will be received by the Bd. Pub. Service (Geo. F. Holmes, Clk.) until Dec. 26 for furnishing material and constructing sewers and drains in portions of Henshaw, Monteith and Woodlawn Aves.; also until Jan. 9 for constructing sewers and drains in a portion of Ravine west of Morrison Ave.

Cleveland, Okla.—An election will be held Jan. 8 to vote on issuing $30,000 bonds for a sewerage system. Engineer, D. B. Merry, of Tulsa, Ind. Ter.

St. Johns, Ore.—W. W. Goodrich, City Engr., writes that bids are wanted Feb. 1 for the construction of a sewerage system, to cost about $50,000.

Erie, Pa.—The Select Council on Dec. 4 passed an ordinance providing for a vote of the citizens on the question of issuing $270,000 bonds, of which $200,000 is for the purpose of building intercepting sewers in the valley of Mill Creek, and along the bay front, $20,000 for the construction of 4 concrete bridges across Mill Creek, and $50,000 for the construction and equipment of a garbage disposal plant.

Allentown, Pa.—The Chamber of Commerce is reported to have passed an order recommending that the city build a sewerage system, to be owned and controlled by city.

**McKees Rocks, Pa.*—The following are the bids opened on Nov. 27 for the construction of sewers in Stowe Township (R. J. Maconbray, Clk.): Bryan & Sheets, McKees Rock, $10,421 (awarded contract); De Calbre & Co., Pittsburg, $13,415; C. L. Alexander & Co., Pittsburg, $11,947; Mainard & Flim, Pittsburg, $10,482; D. G. Madigan & Co., Swissvale, $14,092; Ott Bros., Pittsburg, $11,118; W. Di Giorus, Pittsburg, $11,469.

Bridgeport, Pa.—The question of constructing a sewerage system is reported under consideration here.

Philadelphia, Pa.—See "Paving and Roadmaking."

Fredericton, N. B.—Bids will be received until Dec. 21 at the office of J. W. McCready, City Clk., for constructing a sewerage system, as advertised in The Engineering Record; probable cost, $92,000. F. A. Barbour, Engr., Boston, Mass.

Peterboro, Ont.—See "Water."

St. Catherines, Ont.—The Bd. of Wks. is reported to be in favor of extending the sewerage system, at a cost of $20,000.

Midland, Ont.—Bids will be received until Dec. 20 by Thos. I. Trueman, Town Clk., for $26,920 bonds for constructing sewers.

Chihuahua, Mex.—See "Water."

BRIDGES.

Notes Arranged Alphabetically by States.

Kankakee, Ill.—It is stated that the Illinois Central R. R. Co. (A. S. Baldwin, Ch. Engr., Chicago) has decided to construct a concrete steel bridge over Kankakee River, replacing present steel structure; estimated cost of proposed improvement is about $75,000.

Paxton, Ill.—It is stated that bids will be received by the Highway Com. of Patton Township until Dec. 21 for constructing the superstructure of a 70-ft. highway bridge. Iro O. Baker, Engr., Champaign, Ill.; V. E. Johnson, Town Clk., Paxton.

Richmond, Ind.—It is stated that bids will be received until Dec. 28 by the Bd. Co. Comrs. (John F. Dynes, Chmn.) for contrusting the Trotter Ford Bridge in Green Township; also McGraw Bridge in Washington Township.

Larrabee, Kan.—Bids will be received until Dec. 23 by the Town Superv. (W. L. Harris, Chmn.) and the Co. Com. (L. A. Burgess, Chmn.), at Larrabee, for constructing a stone arch bridge.

Baltimore, Md.—See "Railroads."

**Hyde Park, Mass.*—The contract for constructing the substructure of the Glenwood Ave. foot bridge has been awarded to M. F. M'Carthy.

Ogallala, Neb.—It is stated that bids will be received until Dec. 19 by the Co. Comrs. for constructing 2 single track wagon bridges across South Platte River at Ogallala, Orin Reed, Co. Clk.

Woodbury, N. J.—It is stated that bids are wanted until Dec. 21 for a highway bridge across Great Egg Harbor River, where same is crossed by new road leading from Williamstown to Winslow. J. J. Albertson, Co. Engr.

New York, N. Y.—At a meeting of the Bd. of Estimate on Dec. 8 an appropriation of $1,000,000 toward the construction of the Hendrick Hudson Memorial Viaduct, over Harlem River, to connect Manhattan and Bronx Boroughs, is reported to have been decided upon. The plans provide for a structure to cost $2,025,000.

Sandy Hill, N. Y.—It is stated that a 1,000-ft. steel bridge, consisting of 15 spans each 60 ft., with 34-ft. roadway, across the Hudson River, to cost $60,000, will be built by the counties of Saratoga and Washington and the Union Bag & Paper Co. It was announced that the bridge would span the river between Fenimore and Sandy Hill.

Cheyenne, Okla.—It is stated that bids will be received until Jan. 3 by John H. Osborn, Co. Clk., for constructing an iron bridge across Washita River, to be 85 ft. long.

Erie, Pa.—See "Sewerage and Sewage Disposal."

Beaver, Pa.—Bids will be received until Dec. 18 by the Bd. Co. Comrs. (Geo. W. Carey, Chmn.) for $465,000 bridge bonds.

Vermillion, S. D.—Bids will be received until Jan. 5 by F. A. Erickson, Co. Aud., for constructing all bridges in Clay County for the year 1906.

Redfield, S. D.—It is stated that bids will be received until Dec. 28 by W. M. McDonald, Co. Aud., for furnishhing material and constructing all bridges that may be required during the year 1906.

Brookings, S. D.—Bids will be received until Jan. 9 by the Bd. Co. Comrs., for furnishing material and constructing all bridges that may be ordered during the year 1906. P. J. Murphy, Co. Aud.

Knoxville, Tenn.—T. J. Moreland, City Engr., has prepared plans for a viaduct across Asylum Ave., to cost about $35,000. The question of constructing this viaduct will probably be taken up in the spring.

** Items marked thus give the names of parties awarded contracts.*

New York, N. Y.—The following are the bids opened on Dec. 7 by Louis F. Haffen, Pres. Bronx Boro., for widening the bridge over the N. Y. & Harlem R. R., at 177th St.: (*a*) M. J. Leahy, $37,671; (*b*) M. A. Ryan, $30,615; (*c*) Milliken Bros., $34,240; (*d*) Cooper & Evans, $35,647; (*e*) Culgin, Pace Constr. Co., $31,204; (*f*) Leslie McHarg & Co., $24,719; (*g*) W. J. Brennan, $32,308; (*h*) F. V. Smith Con. Co., $28,975; (*i*) John Kenny, Jr., 39 Cortlandt St., $22,070; (*j*) Snare & Triest Co., $30,026.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
Removal and disposal of old material (lump sum)....	$1000.00	$1100.00	$1800.00	$3000.00	$1.00	$1000.00	$500.00	$1000.00	$500.00	$800.00
50 cu. yds. broken range ashler masonry	16.00	11.00	14.00	30.00	10.00	12.00	9.00	15.00	9.00	10.00
160 cu. ft. bridge seats, fenders and coping........	5.00	3.00	4.50	5.00	3.50	2.00	2.00	4.00	2.00	3.00
85 cu. yds. concrete, Class A	12.00	8.00	12.50	15.00	9.25	10.00	9.00	9.00	12.50	15.00
200 cu. yds. concrete, Class B	9.00	6.00	6.00	8.00	7.60	5.00	8.50	7.00	6.50	6.00
70 lin. ft. new curb........	.80	2.10	1.75	1.75	.90	1.25	.85	1.00	1.50	1.50
50 lin. ft. old curb........	.40	1.00	1.25	1.00	.20	.40	.20	.40	1.00	.50
340,000 lbs. iron and steel..	.07	.06¼	.06¾	.06	.07	.047	.065	.06	.0405	.06
2,650 sq. ft. woven wire fbr.	.10	.05	.12	.30	.055	.15	.08	.10	.08	.05
850 sq. yds. sheet asph. pavt.	2.90	1.80	2.25	2.15	1.75	1.25	3.00	1.00	1.30	2.00
530 sq. yds. blk. asph. pavt.	3.00	1.25	3.25	3.25	2.25	2.00	2.50	2.00	1.80	2.50
71 lin. ft. ornamental railing	5.00	3.00	3.45	5.00	3.00	2.00	2.00	5.00	2.00	4.00
1 receiving basin rebuilt..	200.00	120.00	225.00	400.00	175.00	200.00	175.00	100.00	100.00	300.00
Removing, relaying and connecting water pipe (lump sum)	3500.00	2500.00	1200.00	1800.00	750.00	2000.00	2000.00	1300.00	2000.00	1500.00

Richmond, Va.—See "Railroads."

Manitowoc, Wis.—Press reports state that bids for constructing the Main St. bridge have been extended from Dec. 18 until Jan. 6; probable cost, $100,000. John S. Unger, City Clk.

Kilbourn, Wis.—Bids will be received until Dec. 29 by I. C. Bennet, Village Clk., for constructing a 75-ft. steel arch bridge. W. G. Kirchoffer, Consulting Engr., Madison, Wis.

La Crosse, Wis.—Bids, including plans and specifications, will be received until Dec. 23 by the Special Com., Co. Bd. Superv. (J. L. Pettingill, Chmn.) for furnishing material and constructing a steel bridge on the McGilvray Road, on steel tubular piers filled with concrete; bids to be submitted for a 1-span bridge 130 ft. long, or 2-span bridge, each span to be 65 ft. long, with a 16-ft. roadway.

Flambeau, Wis.—The Hewitt Bridge Co., of Minneapolis, Minn., is stated to have submitted the lowest bid for constructing a steel bridge over Chippewa River, near here; the bid was $13,780.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

**Live Oak, Fla.*—The contract for constructing 40 miles of hard road in different sections of the county (bids opened Dec. 8) has been awarded to R. Huggen & Bro., of Montgomery, Ala., for $119,600. J. W. Bryson, Clk. Circuit Court.

Danville, Ill.—It is stated that the Comrs. of Hendricks County will soon receive bids for constructing a gravel road in Franklin Township.

Rochester, Ind.—Wm. M. Brown, Town Clk., writes that bids will be received Dec. 27 for about 20,000 sq. yds. brick paving.

**Brownstown, Ind.*—H. W. Wacker, Co. Aud., writes that the contract for constructing about 1¾ miles of road in Owen Township (bids opened Dec. 5) has been awarded to Sam'l B. Smallwood, of Ewing, for $3,006.

Spencer, Ind.—It is reported that bids will be received in Jan. by the Bd. Co. Comrs. for constructing 5,070 ft. macadamized road in Franklin Township; also 5,321 ft. in Taylor Township and 6,865 ft. in Clay Township. G. O. Mitten, Co. Aud.

Brookville, Ind.—It is reported that bids will be received until Jan. 2 by the Bd. Co. Comrs., for constructing a gravel road in Ray Township. Chas. A. Miller, Co. Aud.

Wichita, Kan.—Press reports state that bids are wanted until Dec. 28 for paving St. Francis Ave. with brick. R. N. Dorr, City Clk.

**Baton Rouge, La.*—R. Swart, City Engr., writes that the following are the bids opened on Nov. 30 by the Bd. of Pub. Wks., for (*a*) 55,152 sq. yds.; (*b*) 31,475 lin. ft. combined curb and gutter (concrete); (*c*) concrete per cu. yd.: Nashville Roofing Co., Nashville, Tenn., *a* (brick pavt.), $1.50 and asphalt, *a* $1.25; *b* 40 cts.; *c* $4.20. Southern Bitulithic Co., Nashville, Tenn., (awarded contract), *a* (bitulithic pavt.), $1.64; *b* 40 cts.; *c* $4.20. Louisiana Improvement Co., New Orleans, *a* (asphalt pavt.) $1.45; *b* 75 cts.; *c* $5.40.

St. Louis, Mo.—It is reported that bids will be received by the Bd. Pub. Improv. until Dec. 22 for improving portions of 17 streets.

Great Falls, Mont.—The City Attorney has been instructed to draft resolutions for the formation of an improvement district, looking to the repaving of Central Ave. with cedar blocks, about 25,000 sq. yds.

**Bayonne, N. J.*—The Uvalde Asphalt Co. is stated to have secured the contract for asphalt pavement on Ave. C, bet. 2d and 18th St. (bids opened Nov. 21) for $49,783 for Venezuela Lake asphalt. For detailed list of bids received for this work, see issue of The Engineering Record Nov. 25.

New York, N. Y.—The following are the bids opened on Dec. 7 by Louis F. Haffen, Pres. Bronx Boro., for repaving with asphalt and asphalt blocks, on concrete foundation, intersections of Bathgate Ave. and numerous other streets in Bronx Boro.: (*a*) Continental Asphalt Paving Co., $17,838, and (*b*) Barber Asphalt Paving Co., $18,335.

	a	*b*
4,100 sq. yds. asphalt block pav't..........	$1.67	$2.20
980 cu. yds. concrete....................	5.20	4.69
900 lin ft. new curb......................	1.05	1.11
500 lin. ft. old curb......................	.30	.48
2,400 sq. ft. asphalt pav't................	2.00	1.45

Lockport, N. Y.—The Bd. of Supervisors is stated to have decided to improve about 4½ miles of the South Transit Road from Lockport to the Erie County line, at a cost of about $48,000.

Utica, N. Y.—Plans and specifications are stated to have been prepared for improving the Rome-Taberg Road, 5 miles in length, at a cost of $40,350; also the Rome-Northwestern Road, 4 miles long, at a cost of $41,400.

Albany, N. Y.—The Clerk, Board of Supervisors, writes that plans have been approved and the money appropriated by the County for improving the Selkirk and Coeymans Road. Cost reported to be $41,000. For further information address the State Engineer.

Syracuse, N. Y.—Bids will be received until Dec. 18 (readvertisement) by the Bd. Contract and Supply, for furnishing material and paving portions of Tully and Highland Sts., with natural asphalt sheet pavt.; Park Ave., asphalt sheet pavt., or asphalt block, or vitr. brick or block pavt. of standard grade or quality; Leavenworth Ave., with Hallwood, Mack, Johnsburg, Pittsburg, Buffalo, Shawmut or Syracuse brick of standard grade or quality. Geo. J. Metz, City Clk.

New York, N. Y.—The following are the bids opened on Dec. 12 by Louis F. Haffen, Pres. Bronx Boro., for regulating, grading, curbing, flagging sidewalks, etc., in E. 197th St., from Creston Ave. to Bainbridge Ave.: G. I. Bailey, $11,760; P. J. Kane, $13,562; D. W. Moran, $11,336; Dursie & Mancini, $11,622; Haiduven, Schloss Contr. Co., $11,241; Uvalde Asphalt Paving Co., $11,041, and Ambia & Tucillo, $11,666. The detail bid of the lowest bidder, the Uvalde Asphalt Paving Co., is as follows: 3,500 cu. yds. earth excav., 40 cts.; 3,600 cu. yds. rock excav., $1.50; 2,200 cu. yds. fill., 1 ct.; 1,970 lin. ft. new curb, 75 cts.; 75 lin. ft. old curb, 10 cts.; 7,600 sq. ft. new flag., 25 cts.; 200 sq. ft. old flag., 2 cts.; 1,160 sq. ft. new bridgestone, 50 cts.; 100 cu. vds. dry rubble masonry, $1.50, and 100 lin. ft. 12-in. vitr. pipe, $1.

Waterford, N. Y.—The Bd. of Superv. is stated to have passed a resolution providing for the paving with macadam Saratoga Ave., the paving to extend from Cohoes and Waterford Bridge to Rural Cemetery arch, the width of road to be 30 ft., and cost $22,000, the state paying $11,000, the county $7,700 and the town $3,300. This will necessitate the construction of a sewer on Saratoga Ave., which will be constructed in the spring.

New York, N. Y.—The Bd. of Aldermen passed the ordinance providing for the issue of $264,000 corporate stock, for the improvement of 7th Ave., from 110th to 153d St.

Brooklyn, N. Y.—Bids will be received until Dec. 27 by Martin W. Littleton, Pres. Boro. for furnishing material and paving with asphalt on Pitkin Ave. and W. 9th St. and for repaving Suydam Pl. Engineer's estimate is as follows: 21,980 sq. yds. asphalt, 3,087 cu. yds. concrete, 470 lin. ft. new curb, 230 lin. ft. old curb reset, and 4 noiseless covers and heads complete for sewer manholes.

Buffalo, N. Y.—Separate bids will be received until Dec. 28 by the Dept. Pub. Wks. (Francis G. Ward, Comr.) for furnishing material and paving portions of Ruhland Ave., Northampton and Metcalfe Sts.

Toledo, O.—Kerlin Bros., 410 Nasby Bldg., are stated to have submitted the lowest bid for paving with brick a portion of Navarre Ave.; their bid was $1.11 per sq. yd.

The Council Com. on Pub. Improv. is stated to have passed ordinances providing for the paving of portions of the following streets: Wakeman, Galena, Baker, Utica, Fassett and Stillman Sts., also Norwood Ave.

Youngstown, O.—Ordinances are stated to have been passed providing for the paving of portions of St. Clair and W. Rayen Aves.

Philadelphia, Pa.—Bids will be received until Dec. Dec. 22 by the Comrs. of Fairmount Park (Jesse T. Vogdes, Ch. Engr. nd Supt.) for furnishing the following supplies and works for the year 1906 for Fairmount and Hunting Parks. Bricks, cement, cast iron, plumber's supplies, trap rock and screenings, sundries and electric and naphtha lights; also paving, cut granite, curbing vitr. blocks, clearing wells, fencing, granolithic and asphalt pavements.

Cleburne, Tex.—It is stated that the contract will soon be let for paving E. Henderson St., at an estimated cost of $16,630.

Lynchburg, Va.—This city desires estimates on Medina Sandstone blocks delivered f. o. b. cars Lynchburg. Samples and the number of blocks required for 1 sq. yd. to be submitted with estimates, as advertised in The Engineering Record.

**Seattle, Wash.*—The Sparger Concrete Co., of Seattle, has secured the contract for concrete sidewalks on Prospect St. for $4,206.

*The contract for grading 32d Ave. and other streets has been awarded to O. E. Olsen & Co., of Seattle, for $9,323.

Tacoma, Wash.—Probably 10 miles of pavement will be laid in this city, mostly asphalt. Frank L. Davis, City Engr.

Red Deer, Alta, Can.—It is proposed to expend $4,000 for street improvements. L. C. Fulmer, Secy.-Treas.

Peterboro, Ont.—See "Water."

POWER PLANTS, GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Jasper, Ala.—The Jasper Light & Power Co. (J. M. Cranford, Pres., Jasper) proposes laying a mile of wire and installing new engine and 75-kw. generator.

Montgomery, Ala.—The Citizens' Light, Heat & Power Co. proposes installing a 500-kw. alternator, 2,200-volt, with Corliss engine or turbine to drive same. P. P. Whiting, Mgr.

Pocahontas, Ark.—S. C. Dowell, of Walnut Ridge, is reported interested in the construction of an electric light plant at this place.

Anaheim, Cal.—It is stated that the Bd. Trus. will receive bids until Jan. 9 for a franchise for gas pipe line. Edw. Merritt, City Clk.

Loyalton, Cal.—The Loyalton Electric Light Co. (R. W. Bender, Mgr., Loyalton) has in contemplation extensive improvements, requiring a plant of 5,000 to 10,000 h.p. water power.

Eureka, Cal.—The North Mountain Power Co. (John M. Vance, Pres., Eureka) proposes constructing a 5,000-h.p. hydraulic plant.

Boulder, Colo.—Harry D. McCutcheon, of Pittsburg, Pa., is reported interested in the development of the water power here, and is reported to have asked City Council for a franchise.

Washington, D. C.—U. S. Senator Gallinger has introduced a bill to incorporate the Economic Heating & Refrigerating Co. The bill provides that F. L. Shober, Jr., George Truesdell, George W. Young, Byron T. W. Duke, Jr., H. W. Fuller and George H. Harries shall be the incorporators of the company, which shall have right to construct conduits and lay pipes in the streets, under such regulations as the Commissioners may prescribe. Capital, $4,000,000.

An explosion at the plant of the Washington Gas Light Co. is reported to have damaged the plant to the extent of about $150,000., The building was demolished, but the machinery is reported to have not been damaged to any great extent.

Washington, D. C.—Bids will be received until Dec. 26 at the Bureau Supplies and Accounts, Navy Dept., Washington, to furnish at the Navy Yards, etc., Portsmouth, N. H.; Boston, Mass.; Newport, R. I.; New York, N. Y.; League Island, Pa.; Washington, D. C., and Norfolk, Va., a quanity of naval supplies, as follows: Schedule 269, motor, generator sets, conduit and fittings, electrical supplies, pine, etc. Schedule 271, copper and brass, force pump, etc. Schedule 272, white and yellow pine, bar iron, plain and galvanized bar steel and shapes, Portland cement, etc., also Jan. 9, to furnish at the navy yards, Mare Island, Cal., and Puget Sound, Wash., a quantity of naval supplies, as follows: Schedule 276, motors, cable, circuit breaker, electrical supplies, bar steel, steel castings, copper pipe, etc.; bids will also be received until Jan. 9 to furnish at the navy yards, Portsmouth, N. H.; Boston, Mass., and Norfolk, Va., and the Naval Coal Depot, Frenchman's Bay, East Lemoine, Me., a quantity of machine tools, as follows: Schedule 279, piston inlet air compressor. Schedule 280, buzz planer. Schedule 281, electric hoist and runway. Schedule 282, electric motor driven outfit, arbor press, milling machine, engine lathe, shaft straightener, etc. Schedule 283, automatic screw machine. Applications for proposals should designate the schedules desired by number. H. T. B. Harris, Paymaster Gen., U. S. N.

*Horn & Brennan, of Philadelphia, Pa., has secured the contract for furnishing and placing lighting fixtures in the west out building of the U. S. Bureau Engraving and Printing, bids opened Nov. 25 by the Superv. Archt., Treas. Dept., for $2,917.

Jacksonville, Fla.—It is reported that bids will be received by the Bd. of Bond Trus. until Jan. 4 for installing a boiler of 300 h.p. in the city electric light plant.

**Seattle, Wash.*—Bids were opened on Dec. 2 by the Bd. of Pub. Wks. for the improvement of Prefontaine Pl. and other streets. The following are the totals of bids received, also detail bids on some of the items required: (*a*) Stirrat & Goertz, Inc., $125,925; (*b*) Barber Asphalt Paving Co., $107,577; (*c*) Bell & Price, $118,405; (*d*) Sparger Concrete Co., $117,879; (*e*) F. McLellan & Co., $112,965.

	a	*b*	*c*	*d*	*e*
Fixed estimate	$3000.00	$3000.00	$3000.00	$3000.00	$3000.00
Cleaning and grubbing, lump sum..............................	1000.00	800.00	1000.00	800.00	500.00
12,000 cu. yds. earthwork..................................	.40	.25	.40	.40	.27
300 lin. ft. 6-in. pipe sewer................................	1.10	.60	1.50	1.20	.40
510 lin. ft. 10-in. pipe sewer...............................	1.35	1.60	1.50	1.60	1.00
900 lin. ft. 12-in. pipe sewer...............................	1.75	1.75	2.50	1.75	1.50
10 manholes to be adjusted..................................	30.00	10.00	20.00	30.00	15.00
10 4½-ft. manholes	55.00	50.00	70.00	50.00	65.00
22 catch basins, single inlets................................	60.00	55.00	60.00	50.00	50.00
11 catch basins, double inlets................................	70.00	65.00	70.00	60.00	60.00
11,350 lin. ft. curb, straight, granite.........................	1.45	1.10	1.33	1.40	1.27
800 lin. ft. curb, curved, granite............................	1.75	1.25	1.55	1.60	1.27
500 lin. ft. curb reset.....................................	.45	.25	.50	.50	.40
10,000 lin. ft. sub-drains..................................	.07	.08	.12½	.10	.15
14,600 sq. yds. brick pavt..................................	2.40	2.10	2.23	2.25	2.22
10,850 sq. yds. sandstone pavt..............................	3.30	2.95	2.90	2.95	2.87
200 sq. yds. brick pavt....................................	1.40	1.00	1.50	1.30	1.22
425 sq. yds. brick pavt....................................	2.40	2.00	2.35	2.15	2.22
25,450 sq. yds. gravel base.................................	.15	.10	.12½	.14	.10
2,920 lin. ft. 12-in. C. I. pipe, Class "A"......................	2.35	2.08	2.25	2.10	2.49
1,250 lin. ft. 12-in. C. I. pipe, Class "B"......................	2.75	2.49	2.50	2.55	2.56
320 lin. ft. 6-in. C. I. pipe, Class "B".........................	1.20	1.04	1.20	1.10	1.00
14 gates removed and reset..................................	10.00	10.00	10.00	10.00	10.00
11 hydrants to reset.......................................	12.00	20.00	10.00	5.00	15.00
60 sq. yds. concrete.......................................	1.25	1.00	1.20	1.20	1.00
25 M. ft. lumber..	13.00	15.00	16.00	16.00	10.00

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* *Items marked thus give the names of parties awarded contracts*

Richland, Ga.—An election will, it is stated, soon be held to vote on issuing $15,000 electric light bonds.

Tallapoosa, Ga.—Bids will be received until Jan. 2 by Mayor G. W. Shepperd and Council for machinery and material and installing complete an electric light plant. The proposed plant embraces one 66-in. x 18 ft. high-pressure boiler and stack, one 100-kw. a.-c. unit. Bids will be received on generator belted to Corliss engine, and also on generator direct connected to automatic engine, 6 arcs and 74 50-c.-p. series incandescents, 1,000-light transformer and meter capacity and pole line. J. B. McCrarry, Engr., Senoia, Ga.

Chicago, Ill.—Bids will be received until Dec. 20 by the Bd. of Inspectors of the House of Correction of the city of Chicago for furnishing and delivering electrical supplies, steam fitters' and engineers' supplies, sewer pipes, cement, sand, etc.

Monmouth, Ill.—Wm. & S. Mainland, of Oshkosh, Wis., and W. J. Ferris, of Chicago, Ill., are intrested in the construction of an electric light plant here, to be known as the Monmouth Gas & Electric Co. Engineer, O. G. F. Markhus, of Oshkosh.

East Moline, Ill.—A. A. Woodworth, of East Moline, is reported to have petitioned for a franchise for an electric light plant.

Jacksonville, Ill.—S. B. Stewart, City Clk., writes that no definite plans have been made as yet for the construction of an electric light plant, to cost from $8,000 to $16,000. Appropriation will be made in January.

Michigan City, Ind.—The Michigan City Light & Power Co. is reported incorporated, with a capital of $150,000, by Robt. F. Garrettson, and others.

Jasper, Ind.—It is proposed to install at the municipal electric light plant a new 150-kw. alternating dynamo. Jos. P. Kunkel, Purchasing Agent.

Andrews, Ind.—Nichola & Thornton are reported to have secured a franchise for water works and an electric light plant.

Council Bluffs, Ia.—The Citizens' Gas & Electric Co. is reported to have decided to expend about $50,000 in improving the gas plant.

Creston, Ia.—The Creston Mutual Electric Light, Heat & Power Co. is reported to have petitioned for a gas franchise.

Belleville, Kan.—The question of establishing an electric light plant in connection with the water works is reported under consideration here.

New Orleans, La.—The Committee on Fire and Lighting on Dec. 7 reported favorably on the ordinance authorizing Peter Gallagher and others to maintain and operate a gas light and heating plant and to make, vend and distribute gas in the city. The privilege is to cover a period of 50 years, during the first 20 years of which the company is to confine itself to the distribution and sale of fuel gas. After 1925, when the franchise of the New Orleans Gaslight Co. shall have expired, it will then distribute and vend gas light as well as fuel gas.

Croswelll, Mich.—The citizens are reported to have voted to issue $5,000 bonds for water works and a lighting system.

Coldwater, Mich.—It is proposed to install a 150-h.p. compound engine at the municipal electric light plant. John A. Cavanagh, Supt.

Elbow Lake, Minn.—Bids will be received until Jan. 4 by J. S. Arneson, Co. Aud., for furnishing electric light fixtures in the Grant County Court House.

Aiken, Minn.—The Council is reported to have decided to purchase a dynamo, 95 to 125 kw., for the city lighting plant.

St. Cloud, Minn.—The Public Service Co. (A. G. Whitney, Pres.) is reported to have decided to construct a gas plant, at a cost of $55,000.

Crookton, Minn.—A committee has been appointed to look into the advisability of constructing an electric plant to light court house and jail. N. A. Hoffard, Co. Aud.

Farmington, Minn.—The question of constructing water works and an electric light plant is reported under consideration.

Aberdeen, Miss.—This city will in a short time be in the market for a 200-kw., 60-cycle alternator, 1,040 and 2,080 volts. J. M. Acker, Mayor.

Joplin, Mo.—The Consolidated Light, Power & Ice Co. is reported incorporated with a capital of $1,000,000 by Geo. Moore, A. M. Barrow, David Hoag and others. This corporation has merged the Southwest Missouri Light Co., of Joplin, and the Missouri Ice & Cold Storage Co.

Kirksville, Mo.—The Kirksville Gas, Heat & Electric Co. is reported incorporated, with a capital of $30,000, by Fred Grassie, Chas. Sands, and others.

Harlem, Mont.—This town is reported to have in contemplation the construction of an electric light plant.

Kearney, Neb.—The North Western Electric Heat & Power Co. is reported to have changed hands, and it is stated that the plant will be enlarged and improved, and the canal to Platt River will be repaired.

Vineland, N. J.—Next summer a new engine, boiler and steam piping will be installed at the municipal electric light plant.

Newark, N. J.—Bids will be received until Jan. 16 by the Comrs. for the erection of the new City Hall (Jas. E. Howell, Chmn.) for furnishing and installing bronze lamps and gas fixtures for the new City Hall and boiler house on Broad St.

New York, N. Y.—The following are the bids opened on Nov. 28 by the Armory Bd. for lighting fixtures for the 71st Regt. Armory: Mitchell-Vance Co., 836 Bway., $18,375; Cassidy & Son Mfg. Co., 133 W. 33d St., $17,200, and L. Plaut & Co., 434 E. 23d St., $15,887.

North Tonawanda, N. Y.—The Bd. of Aldermen is stated to have granted a franchise to the Niagara Falls Electrical Co.

Rome, N. Y.—Bids will be received by Jas. A. Douglass, Pres. Bd. Mgrs. Rome Custodial Asylum, at Rome, until Dec. 30, for electric wiring for lighting, flat irons and ironing machines, at the Asylum, as advertised in The Engineering Record.

Newark, N. Y.—The Niagara, Lockport & Ontario Power Co. is reported to have secured franchises in Newark, Lyons and Clyde. E. D. Beal, of Rochester, and S. Nelson Sawyer, of Palmyra, are attorneys for the company.

Union, N. Y.—A. Ray Humphrey, Village Clk., writes that the citizens voted Dec. 5 to issue $15,000 bonds for the construction of an electric light plant.

Hillsboro, O.—The Hillsboro Light & Fuel Co. is in the market for an engine and dynamo, 2,200 volts, 60 cycle, single phase.

Niles, O.—B. L. Hogan, City Aud., writes that $20,000 bonds have been sold, to be used for improving water works and electric light plant. Bids for construction will be received in about 30 days.

Portland, Ore.—The Cascade Power Co. is reported to have decided to harness the headwater of Sandy River, at a point 14 miles above Bull Run pipe line bridge, and there establish a plant with sufficient capacity to develop 25,000 h.p. E. R. Richardson and A. C. Churchill & Co. are reported interested.

McMinnville, Ore.—H. S. Maloney, City Recorder, writes that new bids will probably be called for in about 60 days for water works and an electric light plant, to cost from $60,000 to $80,000. Engineer, H. M. Bostoph, Ogden, Utah.

Philadelphia, Pa.—See "Paving and Roadmaking."

Edgefield, S. C.—A committee is reported to have been appointed, with J. C. Sheppard as Chairman, to consider the question of constructing water works and an electric light plant. C. E. May is Mayor.

Alexandria, S. D.—C. H. Peckham writes that he proposes constructing here an acetylene gas plant, at a cost of $3,500.

Beaumont, Tex.—Emmett Landry is reported to have decided to petition for a franchise for an electric light plant.

Brownwood, Tex.—The Brownwood Gas Co., of Brownwood, is reported incorporated, with a capital of $60,000, to supply light, heat and power. Incorporators: Brooke Smith, I. J. Rice, and others.

Provo, Utah.—Frank C. Kelsey, of Salt Lake City, will be engineer for the proposed water works and electric light plant for which the city recently sold $91,000 bonds. W. E. Harding, City Recorder.

St. Johnsbury, Vt.—John R. Dawson, of Boston, Mass., is reported to be considering the question of establishing a gas plant in St. Johnsbury.

North Yakima, Wash.—The Northwest Light & Water Co. is reported to have issued $230,000 in bonds, to be used for improvements. It is proposed to construct power plant and 10 miles of transmission line.

Port Townsend, Wash.—The City Council is stated to have granted John Siebenbaum a franchise for an electric light plant.

Vancouver Barracks, Wash.—Bids will be received until Dec. 30 by the Constr. Q. M., for furnishing electric light fixtures, wattmeters and transformers for 3 buildings at this post.

Dayton, Wash.—L. J. Davis is reported to have petitioned for a franchise for a gas plant.

Brillion, Wis.—The Brillion Light Co. is reported incorporated with a capital of $20,000 by C. W. Behnke and others.

Owen Sound, Ont.—This city is reported to be figuring on installing at the municipal electric light plant a 300-kw. generator, 3-phase, driven by engine direct and three new boilers. Jos. McLinden, Supt. and Chief Electrician.

Eugenia, Ont.—The Georgian Bay Power Co., of Toronto, Ont., will construct a power plant at Eugenia, to cost about $250,000. Bids will be called for about April 1. Engineer, H. von Schon, of Detroit, Mich.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Martinez, Cal.—It is reported that Col. W. S. Rheem is planning to extend his East Shore & Suburban R. R. from San Pablo to Martinez, thus making a through line to this point from Oakland, a franchise having been obtained in this city.

Ventura, Cal.—The Independent R. R. Co. is reported to be planning to build an electric railway from Ventura, through Casitas Pass, to Santa Barbara. R. A. Phillips, Pres., and H. W. Lemcke, Gen. Mgr.

San Francisco, Cal.—It is stated that the United Railroads (Geo. F. Chapman, Ch. Engr.) intends to extend its Lulton St. electric road from 24th Ave. to the ocean beach.

Thos. P. Woodward, City Engr., writes that bids will be received by the Board of Supervisors until Jan. 3 for the construction of the municipal underground conduit railroad on Geary St. and Point Lobos Ave.; estimated cost, $346,104.

The San Jose & Santa Clara R. R., including the Santa Clara St. and the Alum Rock lines, reported to be the Southern Pacific Co., is reported to have asked for an extension of the franchise. It is stated that they are preparing to double track and broad gage the entire system at an expense of $1,000,000 providing the franchise is granted.

San Jose, Cal.—The San Jose & Santa Clara Electric Ry. Co. (Hugh Center, Mgr.) is stated to have applied to the City Council for a franchise to build a branch road out 14th St.

It is stated that the San Jose & Los Gatos Interurban Ry. (J. H. Parson, Engr.) will be extended to Mayfield. Work is to start soon on the road, which will be of standard gage.

Brunswick, Ga.—The Southern Electric, Gas & Water Co., which has the franchise for the building of a street car line in Brunswick, is stated to have announced that work on the new road will begin immediately. J. H. Neff, of Jacksonville, Fla., Pres.

East St. Louis, Ill.—At the meeting of the City Council the Streets and Alley Com. is reported to have recommended the granting of a franchise to the Illinois & Indiana Electric R. R. Co. to operate a railroad on 4th and 10th Sts., where a branch will be run south to Falling Springs Ave. and to the city limits.

Evansville, Ind.—Articles of incorporation have been filed for the Louisville Northern Ry. & Lighting Co. Capital $5,000,000. The object of the company is to build a network of traction lines in this section of the State. The electric lines shall run through Clark, Floyd, Harrison and Washington Counties to West Baden, Salem and French Lick, then through the counties of Crawford, Perry, Spencer, Warrick and Vanderburg to Evansville, and then through the counties of Scott and Jefferson to the city of Madison, and through the counties of Jackson and Jennings to Seymour and North Vernon.

Terre Haute, Ind.—The construction of an interurban railway from Terre Haute to Kokomo via Darlington and Frankfort is reported under consideration. P. M. Dunn, of Indianapolis, and H. C. Woody, of Darlington, are reported interested.

Indianapolis, Ind.—The Indianapolis & Frankfort Traction Co. is reported incorporated for the purpose of building from Carmel, through Frankfort, Westfield, Hortonville, Sheridan, Terhune, Kirkwood and Cyclone. Capital, $12,000. Directors: Frank E. Gavin, Theo. P. Davis and Albert G. Pearson.

Des Moines, Ia.—Thos. J. Wilcox, of Clinton, promoter of the Central Ry. Co. of Iowa, which proposes to build an electric interurban railway from Des Moines to Ames and Nevada, is reported to have stated that construction of the line would be commenced next spring. As soon as plans and profiles are completed bids on construction work will be received.

The Des Moines, Winterset & Creston Interurban Ry. Co. (A. E. Parks, Gen. Mgr.) is reported to have decided to complete the surveys for the road, prepare plats and profiles, preparatory to letting the contract for grading the line in the spring. The proposed route is from Valley Junction through Commerce, McBride, Winterset, Macksburg to Creston.

Augusta, Me.—Articles of association are stated to have been filed at the office of the State Bd. of Railroad Comrs. by the Portland & Brunswick Extension Ry., for a line to be operated by electricity or compressed air, in the towns of Yarmouth, Cumberland and Falmouth and Portland. Capital, $48,000. Directors: E. J. Lawrence, of Fairfield, and Cyrus W. Davis, of Waterville, and others.

Trenton, N. J.—The City Council has passed the "loop" ordinance over Mayor Katzenbach's veto, and it is now expected that the Trenton St. Ry. (P. E. Hurley, Gen. Supt.) will lay curves at State and Warren, Broad and Perry and Perry and Warren Sts. in the spring, so that Princeton and Pennington cars can pass around a loop.

Camden, N. J.—The directors of the West Jersey & Seashore R. R. Co. (J. H. Gumbes, Asst. Engr., Camden) have approved the plan for equipping with electricity the line from Camden, N. J., to Atlantic City, in Newfield, and from Newfield to Millville. The electric line will be in operation July 1. W. H. Brown, Ch. Engr., Philadelphia, Pa.

Yonkers, N. Y.—The Bronx, Yonkers & White Plains Ry. is reported incorporated with the Secretary of State, to build and operate an electric surface road 11 miles in length. Capital, $110,000. Directors: John H. Matthews, Geo. Matthews, and others, of New York City.

Fairport, N. Y.—The Rochester, Syracuse & Eastern Ry. Co. (Thos. H. Mather, Ch. Engr., Syracuse) is stated to have received a franchise to place its tracks on John and Mill Sts.

Cleveland, O.—The South Lorain & Eastern Traction Co. is reported incorporated by A. B. Stuber, A. A. Lederer, D. T. Miller and others of Cleveland, to build a line from Cleveland to South Lorain.

Newark, O.—The Ohio Power Co., of Zanesville, is stated to have decided to build a line from Newark through Mt. Vernon to Mansfield.

South Bethlehem, Pa.—A charter for an electric railway from South Bethlehem to Centre Valley is reported to have been secured by C. P. Hoffman, A. L. Cope and W. H. Lauer, of South Bethlehem. The new line will be connected with the Philadelphia & Lehigh Valley Traction Co.'s line at Centre Valley.

Salt Lake City, Utah.—Fred G. Palmer has filed with the Co. Comrs, a petition for a franchise for an electric railroad system throughout Salt Lake County.

Tacoma, Wash.—The Tacoma Ry. & Power Co. (W. S. Dimmick, Mgr.) is reported to have agreed on a plan for extending its Point Defiance line through the business section of Tacoma, at an estimated cost of $60,000.

RAILROADS.

Notes Arranged Alphabetically by States.

**Athens, Ga.*—The contract for grading the Athens & Jefferson R. R. is reported to have been awarded to Gwathmey & Mackall, of Norfolk, Va.

Davis, Ind. Ter.—H. S. Hackbush, of Coalgate, is reported to be Chief Engr. of a railroad to be constructed from Davis to Coalgate or Lehigh.

Medicine Lodge, Kan.—The Atchison, Topeka & Santa Fe R. R. Co. is reported to have taken out a charter for the Medicine Valley Ry. Co., with a capital of $3,000,000. The subsidiary company proposes to extend the line from Medicine Lodge to Dodge City to connect with the main line, a distance of 95 miles; also to build a line north from Medicine Lodge to Great Bend, 75 miles. The cut-off from Dodge City to Medicine Lodge will shorten the distance of the Santa Fe to the Gulf at least 100 miles. Directors: E. P. Ripley, of Chicago, Ill.; J. E. Hurley, of Topeka, Kan., and others, all of the Santa Fe R. R.

Baltimore, Md.—The Pennsylvania R. R. Co. (W. H. Brown, Ch. Engr., Philadelphia, Pa.) is reported to be considering a new route for its freight line around the city which it is preparing to build. The plan now is to build a branch from the main line just east of the city limits to Canton and across the Patapsco by means of a high bridge to the Anne Arundel county side of the river and build its line around to connect with the main line to Washington at a point well removed from Baltimore.

Camden, N. J.—See "Electric Railways."

** Items marked thus give the names of parties awarded contracts.*

Brooklyn, N. Y.—The following are the bids opened on Dec. 12 by the Brooklyn Grade Crossing Comn. for the Bay Ridge Improvement, to consist of 1,000,000 cu. yds. excav., 15,000 cu. yds. concrete, etc.: (*a*) Beinhauer & See; (*b*) Jas. H. Holmes; (*c*) McLaughlin Constr. Co.; (*d*) Degnon Constr. Co.; (*e*) Ford & Waldo; (*f*) Lennon-Terry Constr. Co.; (*g*) F. H. Clement & Co.; (*h*) Chas. A. Sims & Co; (*i*) H. S. Kerbaugh; (*j*) J. G. White & Co.; (*k*) W. H. Gahagan; (*l*) Fergurson Constr. Co.; (*m*) Ryan & Kelly; (*n*) Jas. A. Hart Co.; (*o*) Phœnix Constr. Co.; (*p*) Uvalde Asphalt Co.; (*q*) J. F. Shields; (*r*) John M. Murphy; (*s*) Chas. Cranford; (*t*) S. M. Greene:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*	*s*	*t*
Concrete, Class 1—1:2:4	$6.25	$6.69	$5.65	$7.50	$6.85	$6.75	$7.00	$7.40	$6.16	$7.50	$6.60	$9.00	$6.75	$8.00	$7.25	$6.50	$5.98	$8.04	$6.63	$6.80
Concrete, Class 2—1:2½:4	6.00	6.49	5.50	7.05	6.60	6.55	6.80	6.75	6.15	7.00	6.30	9.00	6.50	7.75	7.00	6.20	5.95	7.25	6.53	6.65
Concrete, Class 3—1:3:5	5.85	6.25	5.35	6.55	6.30	6.10	6.00	6.65	5.89	6.50	6.00	6.50	6.25	6.50	6.75	5.80	5.92	7.25	6.23	5.90
Concrete, Class 4—1:3:6	5.50	6.21	5.20	6.45	6.25	6.05	5.80	6.50	5.81	6.50	5.90	6.25	6.00	6.40	6.50	5.70	5.90	7.12	6.06	5.75
Concrete, Class 5—1:4:6	5.50	5.97	5.10	6.00	5.95	5.95	5.50	6.25	5.63	6.25	5.60	6.00	5.75	6.30	6.25	5.50	5.50	6.84	5.97	5.70
Excavation	.345	.71	.33	.38½	.56	.56	.45	.39	.49	.84	.32	.49	.41	.70	319	.35	.53½	.42	.51	.39
Excav. on cars, Manhattan Junct.	.33	.59	.28	.38½	.43	.55	.37	.37	.29	.79	.30	.40	.39	.65	.303	.30	.49	.40	.48½	.32
Foundation excav.	.98	1.67	.65	1.50	.70	.84	.65	.75	.85	1.50	.90	2.00	.75	1.00	1.50	.65	.75	.80	.65	.69
12-in. vitr. pipe sewer	.44	.53	.60	.60	.47	.55	.25	.95	.40	.50	.60	.75	.40	.50	.50	.75	.45	.66	.46	.65
15-in. vitr. pipe sewer	.56	.85	.75	1.00	.64	.65	.75	1.25	.54	.80	1.00	1.25	.55	.75	.65	1.00	.65	.82	.62	.96
18-in. vitr. pipe sewer	.71	.97	.95	1.25	.78	.95	1.00	1.50	.68	1.00	1.20	2.00	.72	1.15	.80	1.50	.78	1.00	.80	1.25
24-in. vitr. pipe sewer	1.42	1.60	1.75	2.00	1.45	1.50	1.30	2.25	1.30	1.85	1.75	3.00	1.35	1.75	1.25	2.00	1.70	1.60	1.40	2.40
Force account extra work	15%	15%	15%	10%	10%	10%	12½%	10%	15%	15%	10%	10%	10%	15%	15%	15%	10%	10%	15%	10%
Time of completion	Dec. 30, 06	Dec. 1, 08	Dec. 1, 07	June 1, 07	Dec. 1, 07	June 30, 07	June 1, 07	Dec. 12, 07	Dec. 13, 06	Dec. 31, 07	No time given	1 yr.	18 mos.	July 1, 08	Jan. 1, 08	Nov. 1, 07	July 30, 07	Aug. 31, 07	July 1, 07	18 mos.

Cincinnati, O.—W. M. Duane, of Cincinnati, Supt. of Construction of the Cleveland, Cincinnati, Chicago & St. Louis R. R. Co., writes that bids will be received until Dec. 28 for the following work: on the St. Louis division, double track roadbed for grade reduction from Indianapolis to Delmar, Ind., 1,370,000 cu. yds.; double-track roadbed for relocation, Delmar to Lona, Ind., 2,275,000 cu. yds., and on Cincinnati division double roadbed for relocation, Middletown to Miamisburg, 600,000 cu. yds.

Oklahoma City, Okla.—Geo. Knapp, Pres. of the Oklahoma & Northwestern R. R., is reported to have applied for incorporation of the Knapp Constr. Co., to construct a line from this city to Supply.

Sewickley, Pa.—Robt. Trimble, of Pittsburg, Ch. Engr. Maintenance of Way, of the Pennsylvania Lines west of Pittsburg, is stated to have been authorized to prepare an estimate of the total cost of abolishing grade crossings from Quaker Valley to Haysville.

Uniontown, Pa.—The Baltimore & Ohio R. R. Co. (D. D. Carothers, Ch. Engr., Baltimore, Md.) is reported to have in contemplation the construction of a line through Uniontown and Waynesburg.

Philadelphia, Pa.—The directors of the Pennsylvania R. R. Co. (W. H. Brown, Ch. Engr., Philadelphia) have authorized improvements which it is estimated will cost $5,000,000. These improvements include the completion of a double track a short distance west of Harrisburg, between Ryde and Mt. Union; changes of grade along the middle division, and four-tracking the Pittsburg division between Bolivar Junction and Sang Hollow, a distance of 15 miles.

Rock Hill, S. C.—John T. Roddey and Chas. W. F. Spencer are reported interested in the construction of a railroad, to be known as the Rock Hill Ry. Co.

Marion, S. C.—The Eddy Lake & Northern R. R. Co. is reported chartered with a capital of $200,000 by Norman W. Jones, W. M. Burgan, George Officer and others, to construct a railroad from Eddy Lake in Buck's Township, through Bucks, Dog Bluff and Gallivant Ferry Townships in Horry County, and Britton's Neck, Legette and Marion Townships in Marion County, to Marion, a distance of 35 miles.

Salt Lake City, Utah.—Archibald C. Milner, Vice- Pres. Coal Belt Ry. Co., writes that the proposed roadbed and track equipment will cost about $2,000,000. Date of receiving bids not yet decided upon. Engineer, F. Jacobs, Salt Lake City.

Bristol, Va.—A charter is reported to have been issued to the South & Western R. R. Co., with a capital of $600,000, the principal incorporators being in Bristol, Va., and Bristol, Tenn. The route of the proposed road is from a point on the line between North and South Carolina, where Polk and Rutherford County lines intersect the State line, and northwest through the valleys of Broad River, Mountain Creek, Catawba River and Toe River, through Polk, Rutherford, McDowell, Yancey and Mitchell Counties, to a point where Toe River crosses the State line; the distance is 120 miles. It is understood that this road will be a connecting link for the road now in operation from Johnson City to Spruce Pines and now building from Spruce Pines to Marion, the purpose being an extension through the State into South Carolina. Geo. L. Carter, J. Crawford Biggs, J. N. Powell, are among the incorporators.

*S. Walton, of Falls Mills, Va., is reported to have secured the contract from the George L. Carter syndicate which is building the South & Western Ry., to construct a tunnel through Clinch Mountain near Clinchport, Va.

**Richmond, Va.*—Wm. Northrop, Gen. Mgr. Richmond & Chesapeake Bay Ry. Co., writes that Phillips & Allport, of Richmond, have secured the contract for constructing 2 miles of heavy work, and H. H. George, Jr., of Richmond, has secured the contract for 9 miles of railroad construction (bids opened Dec. 1).

Bids will be received until Dec. 26 by the Richmond and Chesapeake Bay Ry. Co. (C. P. E. Burgwyn, Ch. Engr., for delivering about 50,000 cross ties.

Roanoke, Va.—Bids will be received by McArthur Bros., 810 Fisher Bldg., Chicago, Ill., for grading and masonry on 108 miles of the Tidewater and Deepwater railroads, extending from Roanoke, Va., 108 miles west into West Virginia, as advertised in The Engineering Record.

Lakewood, Wis.—The Chicago & North Western R. R. Co. (E. C. Carter, Ch. Engr., Chicago, Ill.) is reported to have filed an amendment to its charter providing for the construction of a branch line 6 miles in length easterly and northerly from Lakewood.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

Ashland, Ala.—It is reported that bids will be received by the Bd. Co. Comrs. until Dec. 22 for erecting a court house.

Jasper, Ala.—The Commissioner's Court, it is reported, is considering the erection of a court house, to cost about $50,000.

Angel Island, Cal.—Bids will be received until Dec. 30 by Col. Wm. S. Patten, Asst. Q. M., San Francisco, for constructing a set of hospital corps sergeants' quarters at the depot of recruits and casuals, Angel Island.

Wilmington, Del.—The Independence Fire Co., it is stated, will soon ask bids for erecting the 3-story fire house at 12th and Claymont Sts.

Ft. Du Pont, Del.—Bids will be received by Capt. L. F. Garrard, Q. M., U. S. A., Delaware City, until Jan. 11 for constructing frame wagon shed and fire station at Ft. Du Pont, as advertised in The Engineering Record.

Jacksonville, Fla.—It is reported that bids will be received until Dec. 26 by the Bd. of Pub. Wks. for erecting a city jail.

Dublin, Ga.—It is reported that plans have been prepared for a court house to be erected at a cost of $27,000.

Chicago, Ill.—City Architect C. F. Herman has completed plans and the Comr. of Pub. Wks. City Hall, is about to ask bids for the construction of a police station at Hudson Ave. and Blackhawk St. It will be 2 and 3 story, have pressed brick and stone front and cost $20,000.

Louisville, Ky.—Col. Jacob Haager, it is stated, has petitioned the Fiscal Court to install a new heating plant in the armory.

Baltimore, Md.—Bids will be received until Dec. 20 by the Bd. of Awards (E. Clay Timanus, Pres.) for erecting No. 12 Truck House for the Fire Dept.

*The Centre Market Comn., on Dec. 11, it is stated, decided to recommend to the Bd. of Awards the acceptance of the bid of Chas. McCaul Co., of Philadelphia, Pa., for erecting the superstructure of the retail market on Centre Market space, bids for which were opened Dec. 6) at $173,470. The building is to be of brick with terra cotta trimmings.

Eveleth, Minn.—Plans have been approved by the State Bd. of Control for the City Hall, which is to be erected at Eveleth. W. T. Bray, of Duluth, is the archt. Solomon Sax, Chmn. Advisory Bd.

Hattiesburg, Miss.—The Bd. of Superv., it is stated, is considering the erection of a new jail, to cost $40,000.

Morristown, N. J.—Mayor Charlton A. Reed, it is stated, has recommended to the Bd. of Aldermen that a new municipal building be erected at a cost of about $75,000.

Newark, N. J.—Bids will be received at the office of Cass Gilbert, Archt., 79 Wall St., New York, N. Y., until Jan. 31, for the purchase and removal of the old Essex County Court House, at Newark, as advertised in The Engineering Record.

Geneseo, N. Y.—W. J. Beardsley, of Poughkeepsie, it is stated, has prepared 2 sets of plans for improvements to be made to the jail, one calling for an expenditure of $11,000 and the other an expenditure of $14,200.

Hornellsville, N. Y.—The Bd. of Superv., it is stated, has adopted a resolution authorizing the erection of a court house, and appropriating $30,000 for the purpose.

Patchogue, L. I., N. Y.—It is stated that plans are to be prepared immediately for the Carnegie library which is to be erected at a cost of $10,000.

Brooklyn, N. Y.—All bids opened Nov. 28 by the Armory Bd., in N. Y. City, for extension to the 13th Regt. and for a new floor in the drill hall in the 14th Regt., both in Brooklyn Boro., it is stated, have been rejected. The bids submitted were as follows: Extension to 13th Regt. Armory: Jas. MacArthur, 22 Ormond Pl., Brooklyn, $154,900; Thos. G. Carlin, 215 Montague St., Brooklyn, $139,385; Jas. D. Murphy Co., 1181 B'way, N. Y. City, $153,175; L. W. Seaman, Jr., & Son, 137 Grand Ave., Brooklyn, $149,425; Geo. Hildebrand, 38 Park Row, N. Y. City, $119,800; Clarke & Stowe, 221 Greenpoint Ave., Brooklyn, $131,500; Dan'l J. Ryan, 723 3d Ave., Brooklyn, $149,000; Buckley Realty Constr. Co., Times Bldg., N. Y. City, $135,000; Chas. H. Peckworth, 415 Hudson St., N. Y. City, $141,953, and Thos. McKeown, 521 W. 110th St., N. Y. City, $149,989. Floor in drill hall, 14th Regt. (bidders all of N. Y. City): Chas. Morton & Co., 500 5th Ave., $28,000; Neptune B. Smyth, 1123 B'way, $34,700; Cooper & Evans, 220 B'way, $24,430; Ralph J. F. Gerstle, 341 E. 44th St., $28,842; Chas. Meads & Co., 299 B'way, $19,300, and Wm. Horne Co., 245 W. 26th St., $34,300.

*O. Chas. Meyer, 361 9th Ave., N. Y. City, it is stated, has secured the contract for improvements to the armory of the Second Battalion, N. M. (bids opened by Armory Bd., N. Y. City, on Nov. 28) at $11,950.

The property at Ocean Parkway and Ave. Y, it is stated, has been selected as a site on which to erect the new Coney Island Hospital.

**Buffalo, N. Y.*—Mosier & Summers, 1266 Seneca St., it is reported, have secured the contract for the plumbing work in the 65th Regt. Armory, at a cost of about $33,000.

New York, N. Y.—Bids will be received until Dec. 21 by the Park Bd. (Sam'l Parson, Jr., Pres.) for furnishing material and erecting a new wing to be known as the south wing of the west facade and a permanent cellar passageway running therefrom, for the American Museum of Natural History in Manhattan Sq.

Ft. Slocum, N. Y.—Bids will be received until Dec. 26 by Capt. E. M. Jones, Q. M., for installing new plumbing, together with changes in construction and heating barracks Nos. 35, 38 and 40, and mess hall here.

Ironton, O.—A. C. Robison, Co. Aud., writes that no architect has as yet been selected for the proposed court house. Bids for construction will probably be called for in February.

Cincinnati, O.—Bids will be received until Jan. 9 by the Bd. Pub. Service (Geo. F. Holmes, Clk.) for the structural work required to inclose the administration building at the New General Hospital on Burnet and Eden Aves. and Goodman and Cross Sts. Bids are to inclose excav. and foundation, damp proofing, brick and cut stone work, fireproofing, reinforced concrete work, structural steel and iron work, carpenter work, a sheet metal and tile work. Saml. Hannaford & Sons, Hulbert Blk., are the archts.

Painesville, O.—The citizens, it is stated, have voted in favor of erecting a court house and jail, at a total cost of $200,000.

Philadelphia, Pa.—Stearns & Castor, Archts., Stephen Girard Bldg., it is reported, will soon ask bids for erecting a branch library on Frankford Ave. and Hartel St.

Pittsburg, Pa.—Col. A. J. Logan, Vice-Pres. of the Bd. of Trus. of the West Penn Hospital, it is stated, has announced that the erection of a new building to take the place of the present structure is under consideration.

Nashville, Tenn.—It is stated that plans will soon be received by the Com. appointed to have charge of the work of erecting a new jail. Squire W. G. M. Campbell, Union St., may be able to give further information.

St. Johnsbury, Vt.—The erection of a hospital at a cost of about $20,000 is reported under consideration.

Bremerton, Wash.—Bids will be received until Jan. 20 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for constructing a brick and steel boiler and blacksmith shop building No. 109, for steam engineering, as per specification No. 1,472, at the Navy Yard, Puget Sound.

Madison, Wis.—It is stated that a bill has passed both the Assembly and Senate, providing for a new $2,500,000 capitol.

Laramie, Wyo.—Bids will be received until Jan. 5 by Jas. Knox Taylor, Superv. Archt., Washington, D. C., for the low pressure steam heating apparatus complete in place for the U. S. Post Office at Laramie.

Toronto, Ont.—It is stated that plans have been completed and are now awaiting the approval of the Minister of Pub. Wks., at Ottawa, for the new barracks to be erected in Toronto. It is reported that about 20 buildings of brick and stone will be erected to accommodate the Royal Canadian Regt., the Royal Canadian Dragoons, etc., the cost complete to be about $500,000.

The City Council, it is stated, has approved the plans submitted by G. W. Gouinlock, Temple Bldg., for the Implement & Process Bldg., to be erected on the Exhibition Grounds, at an estimated cost of $84,000.

Belleville, Ont.—It is stated that Henry Corby has given $10,000 to this town with which to erect a library next spring.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

Ft. Smith, Ark.—The Missouri Pacific R. R. Co. (J. R. Emerson, Div. Engr., Ft. Smith) is reported to have decided to complete plans for enlarging its freight depot, at a cost of $10,000.

Los Angeles, Cal.—The Bd. of Governors of the Stock Exchange (J. B. Neville, Chmn.), it is stated, is contemplating the erection of a building for the Stock Exchange on Main and 4th Sts., the cost to be about $400,000.

Denver, Colo.—The F. E. Edbrooke Archt. Co., 510 Opera House Blk., it is reported, is preparing plans for a 6-story business building, to be erected at 15th and Welton Sts. by the Fifteenth St. Investment Co., at an estimated cost of $250,000.

Bridgeport, Conn.—The Bridgeport Theater Co., it is stated, has been incorporated with a capital of $50,000, and intends erecting a theater on Main St. Wm. H. Isham, of Bridgeport, is one of the incorporators.

**Wilmington, Del.*—It is stated that a building permit has been granted to Roydhouse-Ayer Co., of Philadelphia, to erect a passenger station for the Pennsylvania R. R. Co., in this city, at a cost of about $244,700.

Arcadia, Fla.—It is stated that the business portion of the town has been destroyed by fire. Loss reported to be $250,000.

Chicago, Ill.—Irving W. Kelley, 59 Dearborn St., is preparing plans for the reconstruction of a manufacturing building at 1410 Ravenswood Park, the cost to be about $40,000.

Jarvis Hunt, Monadnock Bldg., is preparing plans for a 2-story club building to be built in place of one destroyed by fire Oct. 23 at Sheridan Road and Foster Ave., for the Saddle and Cycle Club. J. L. Cochran is Pres. of the club.

Geo. Purssell, 1311 W. Monroe St., is preparing plans for a store and flat building to be erected at Albany Ave. and Harrison St., for John R. Bowes, Stock Exchange Bldg., 112 La Salle St. It will cost $30,000.

**Bloomington, Ill.*—It is reported that W. C. Carr & Son have secured the contract to erect a passenger station here for the Big Four Ry., to cost about $25,000.

**Indianapolis, Ind.*—John Peirce, of New York, N. Y., it is stated, has secured the contract to erect the Bd. of Trade Bldg. at Ohio and Meridian Sts., at $276,395. It is to be a reinforced concrete structure.

** Items marked thus give the names of parties awarded contracts.*

Bedford, Ind.—Dr. Gaynon, it is reported, has secured a site and intends erecting a hotel to cost $75,000. It is reported that bids for the construction will be asked as soon as plans have been prepared.

Michigan City, Ind.—Edw. Clifford, of the Rowland & Clifford Theatrical Enterprise, it is reported, intends erecting a theater here to cost about $25,000. I. I. Spire, Local Mgr.

**Ardmore, Ind. Ter.*—It is reported that Metzger & Wells have secured the contract to erect a 3-story building for McIlvan & Co., estimated to cost $30,000.

Sioux City, Ia.—Armour & Co., Union Stock Yards, Chicago, Ill., are reported to have plans in preparation for a 7-story ham house, 70x130 ft., and a 3-story beef house, 150x150 ft., to be built next year at Sioux City. The buildings will be of mill construction, with brick and stone exterior, and are estimated to cost $250,000.

Kansas City, Kan.—It is stated that two 3-story brick warehouses belonging to the Standard Oil Co., and located on Baird St. and Kansas Ave., were destroyed by fire on Nov. 30.

Louisville, Ky.—It is stated that plans are being prepared by McDonald & Dodd, of Louisville, for a 7-story building, to be erected at 4th Ave. and Walnut St., to be used entirely by the Stewart Dry Goods Co. (W. E. Ambrose, Mgr.). It is reported that the cost of the building, including site, will be about $650,000.

It is stated that the building at 4th Ave. and Main St., owned by Aaron Kohn and others, is to be remodeled, at a cost of $30,000.

New Orleans, La.—Stone Bros., 818 Common St., it is reported, are preparing plans for a theater which is to be erected at Poydras, Baronne, Lafayete and Dryades Sts., at an estimated cost of $100,000.

Cumberland, Md.—It is reported that Thos. Fitzgerald, Gen. Mgr. Baltimore & Ohio Ry., Baltimore, has announced that plans are being prepared for an office building and station combined which the company proposes erecting here.

**Baltimore, Md.*—John Waters, 23 E. Centre St., it is stated, has the contract to erect a brick and concrete car barn at Light and Heath Sts., for the United Ry. & Electric Co., at a cost of $70,000.

*Thos. B. Stanfield & Son, 109 Clay St., it is reported, have received the contract to erect a 4-story warehouse for Geo. Eppler, at 112 W. Pratt St.

It is stated that the plans for the building for the Metropolitan Savings Bank, to be erected at Charles and Saratoga Sts., and which are being prepared by Parker & Thomas, 612 N. Calvert St., will be ready for bidders about Feb. 1. The building is to be of granite, and marble and limestone trimmings.

Holyoke, Mass.—The New York, New Haven & Hartford R. R. Co. (C. M. Ingersoll, Ch. Engr., New Haven, Conn.) is reported to have decided to erect an addition to its freight house here, 100x40 ft.

**Boston, Mass.*—C. A. Dodge & Co., 8 Beacon St., have secured the contract for constructing a factory building in South Boston, Mass., for W. T. C. McAllen Co., 388 Congress St., Boston; cost, $125,000. M. D. Safford, "A" St., South Boston, Archt.

**West Newton, Mass.*—H. F. Ross Co., Newtonville, has secured the contract for building a brick telephone exchange at West Newton, for the New England Telephone & Telegraph Co., of Boston; cost, $15,000.

Port Huron, Mich.—Christian Kern, it is stated, is about to have plans prepared for a 6-story hotel, which he proposes erecting on Huron Ave. and Butler St., to cost about $40,000..

**Houghton, Mich.*—Verville Bros., of Houghton, it is stated, have secured the contract to erect the Elks' clubhouse, at a cost of $16,335.

**Detroit, Mich.*—The Slater Constr. Co., of Pontiac, it is stated, has secured the contract to erect a chapel and crypts in Evergreen Cemetery, at a cost of $17,500.

Louis Kamper, Goebel Bldg., it is reported, is preparing plans for a 6-story office building to be erected on Adams Ave. by Hugo Scherer.

St. Paul, Minn.—C. H. Johnston, Manhattan Bldg., is preparing plans for the proposed Y. M. C. A. building, to be erected here.

Havre, Mont.—Broadwater & Peppin are stated to have decided to replace their building, recently burned, with a new 3-story brick business block, to cost about $50,000. Architect Shanley, of Great Falls, will probably prepare the plans.

Great Falls, Mont.—Jas. Breen, of Spokane, Wash., it is reported, has purchased a site in this city and intends erecting a hotel to cost about $25,000.

Flushing, L. I., N. Y.—The members of Cornucopia Lodge No. 563, F. and A. M., it is stated, have decided to erect next spring a temple to cost about $30,000.

Buffalo, N. Y.—The shops of the Union Dry Dock Co. and the transfer and freight house of the Erie R. R. on Ganson St., it is reported, were destroyed by fire on Dec. 8.

Rochester, N. Y.—The Directors of the Mechanics Inst. intend erecting a 3-story building to be used as an art building and gallery and to be known as Bevier Memorial. The late Mrs. Susan Bevier of New York City, it is stated, gave the Inst. Directors $300,000 for the erection and maintenance of said building.

Brooklyn, N. Y.—Plans have been filed for a 4-story brick store and tenement, which is to be erected at Degraw St. and Classon Ave., at a cost of $25,000. Owner, T. H. Frazer, 727 Eastern Parkway; A. McLean, 883 E. 35th St., is the archt.

**New York, N. Y.*—Milliken Bros., 11 Bway., it is reported, have secured the contract to erect the passenger station and power house for the Pennsylvania R. R. Co., in this city, at about $1,500,000. It is stated that about 25,000 tons of steel will be used in the construction.

Felix Isman, of Philadelphia, Pa., is stated to have decided to erect a 25-story business building at 1270 to 1280 Bway. and 60 to 62 W. 33d St.

It is stated that the site on which it is proposed erecting the Alpha Delta Phi Club at 136 W. 44th St., is being cleared preparatory to the erection of the building. The structure is to be of granite, limestone and brick, and is to cost about $260,000. Louis Brown, of the Alpha Delta Phi, and the firm of Henry Hornbostel and Geo. C. Palmer, 63 William St., are said to be the Assoc. Archts.

Plans have been filed for a 7-story office and railway post-office building which is to be erected by the New York Central & Hudson River R. R. as a part of its new Manhattan terminal station. The building is to be 224 x 275 ft., of limestone and granite and fireproof construction, and is to cost about $1,000,000. C. A. Reed is archt. for the buildings.

Syracuse, N. Y.—Chas. D. Wilsey, Nottingham Bldg., it is reported, is preparing plans for remodeling the Empire House, the cost to be about $50,000. Andrew S. White, Mgr.

Goldsboro, N. C.—Bids will be received until Jan. 1 by the Bldg. Com. (W. T. Harrison, Chmn.) for erecting a 3-story brick building for Neuse Lodge, No. 6, I. O. O. F. H. E. Bonitz, Archt., Wilmington, N. C.

Cleveland, O.—The Willson Ave., Bldg. Co., it is stated, has been incorporated with a capital of $60,000, for the purpose of erecting a 3-story building on Willson and Scoville Aves., to be used as a dance hall and for lodge rooms. Incorporators: Morris Amster, L. S. Desberg, and others.

The Physicians & Surgeons Bldg. Co., it is stated, intends in the spring, erecting a 10-story office building, to contain a theater, on Broad and Lazelle Sts., at a cost of about $300,000.

*The Hattersley Constr. Co., it is reported, has received the contract to erect a commercial building on Superior St. for Ralph King, the cost to be about $15,000.

Toledo, O.—Bacon & Huber, The Spitzer, it is stated, have prepared plans for an interurban station which is to be erected at Beech, Huron and Superior Sts., at a cost of about $250,000.

H. W. Wachter, 701 The Nasby, it is stated, has prepared plans for a 3-story Arcade building, to be erected on Huron and Erie Sts., at a cost of about $100,000.

Tschumy & Co., 108 Summit St., it is stated, are preparing plans for a 3-story brick hotel which is to be erected at Knapp and Wade Sts., by Entreman Bros., owners of the Entreman Hotel.

Newark, O.—The Newark Trust Co., it is reported, has accepted the plans prepared by Richards, McCarthy & Buford, of Columbus, for a 10-story office building.

Cincinnati O.—The Graydon estate, it is stated, intends erecting an 8-story building at 9th and Sycamore Sts., estimated to cost $150,000.

Lancaster, Pa.—C. Emlen Urban, Trust Bldg., is preparing plans for a store and office building to be erected on Queen St., to cost about $40,000.

**Jenkintown, Pa.*—The Chas. McCaul Co., of Philadelphia, Pa., it is reported, has secured the contract to erect an exchange building in Jenkintown for the Bell Telephone Co., the cost to be about $35,000.

Philadelphia, Pa.—Carl P. Berger, 1416 South Penn Sq., is architect for the proposed Jewish theatre, to be erected in this city at a probable cost of $150,000.

John R. Wiggins & Co., 721 Heed Bldg., it is stated, submitted the lowest bid for erecting a bank building for the Colonial Trust Co. It is to be of granite and is to cost about $240,000.

New Castle, Pa.—S. W. & Frank H. Foulk, Pearson Bldg., it is reported, are preparing plans for a $15,000 brick business building, to be erected on Moravia St., by Isaac Cohen.

Greenville, S. C.—A charter has been granted to the Masonic Temple Co. for the purpose of erecting a temple at S. Main and W. Court Sts., to cost $30,000. L. S. Grandy and Park A. Dallis are among the incorporators.

Britton, S. D.—Downs & Eads, of Minneapolis, it is reported, have completed plans for a store and office building to be erected here by J. F. Brokler, at an estimated cost of $20,000.

Memphis, Tenn.—Pedley & Burrch, of Owensboro, Ky., it is stated are contemplating the erection of a theater on Main St., Memphis, to cost $30,000.

The Pythians, it is stated, are contemplating the erection of a 7 or 8-story building, probably on 2d St., to cost about $75,000.

Nashville, Tenn.—Maj. E. B. Stahlman, it is stated, intends erecting a 12-story office building on College and Union Sts., 105 x 145 ft.

Chattanooga, Tenn.—Bids will be received until Dec. 22 by Henry Fonde, Genl. Agent. Southern Ry., at Knoxville, for the wrecking and entire removal from the grounds, the 4-story brick building with basement, known as the Stanton House, together with the out-buildings, also of brick, said buildings located in the city of Chattanooga. This is the site on which it is stated the Southern Ry. Co. proposes erecting a passenger station, to cost probably $500,000.

The Bldg. Com. of the Shubert Theater Co., it is stated, is considering plans for the theater, which it is proposed erecting at a cost of about $40,000. J. H. Daly, Chmn. Bldg. Com., it is reported, has been authorized to receive bids for excavating the site of the proposed theater.

Norfolk, Va.—The Victoria Hotel Co., it is reported, has been incorporated with a capital of $125,000, for the purpose of erecting a 6-story hotel.

*The contract to erect the Colonial Theatre, it is reported, has been awarded to J. H. Pierce at $125,000.

Spokane, Wash.—It is stated that in the spring Thos. Greenought will erect a hotel on Washington St. to cost about $750,000.

Endicott, Wash.—C. L. Wakefield, it is stated, intends erecting a 2-story building to cost $18,000.

Aberdeen, Wash.—Saml. Benn and others, it is stated, have had plans prepared for a theatre which it is proposed erecting on Market St., at a cost of $20,000.

Walla Walla, Wash.—Robt. Carey, Gen. Secy. Y. M. C. A., writes that Henry Osterman, of Walla Walla, is architect for the proposed Y. M. C. A. building, which will cost between $35,000 and $40,000. Bids will probably be called for in Jan.

Seattle, Wash.—R. Seymour Conklin, it is stated, has prepared plans for a store and apartment house, to be erected at Eastlake Ave. and Ward St., at a cost of $14,000. The Gifford Realty Trust Co., of the Globe Bldg., is reported interested.

Fond du Lac, Wis.—It is reported that bids are wanted until Dec. 22 for furnishing material and erecting a Masonic Temple. Leenhouts & Guthrie, Archts., Milwaukee, Wis.

London, Ont.—O. J. Small, it is reported, is interested in a stock company being organized to build a $60,000 theatre.

Montreal, Que.—The Montreal Light, Heat & Power Co. (W. McLea Walbank, Vice-Pres. and Ch. Engr., Montreal), it is stated, has secured a site on Craig St. and intends erecting an office building for its own use.

New York, N. Y.

Norfolk and Stanton Sts., 6-story br. and stone store and tenemt.; c, $40,000; o, Max Goldberg; a, Horenburger & Straub.

145 Ridge St., 7-story br. and stone shop and loft bldg.; c, $25,000; o, Lena Goergel; a, M. Zipkes.

20 Union Sq., 4-story br. and stone bank and apartment bldg.; c, $275,000; o, Union Sq. Savings Bank; a, Henry Bacon.

313 E. 31st St., 5-story br. and stone stable; c, $30,000; o, Geo. H. Shaffer; a, Alex. Stevens.

92d St. and 1st Ave., 2 6-story br. and stone stores and tenemts.; c, $85,000; o, Harris Kahn; a, M. Zipkes.

98th St. and Lexington Ave., 3 6-story br. and stone stores and tenemts.; total c, $101,000; o, Hyman Romm; a, Fred S. Schlesinger.

1495 3d Ave., 4-story br. and stone store and loft bldg.; c, $20,000; o, M. J. Roth; a, Chas. Stegmayer.

5th Ave. and 111th St., 4-story br. and stone store and hall bldg.; c, $50,000; o, Mrs. Emma R. Harbaugh; a, Delhi & Howard.

20th St. and 6th Ave., 11-story br. and stone loft bldg.; c, $230,000; o, Chas. Brogan; a, Neville & Bagge.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

San Francisco, Cal.—W. G. Hind, 26 Montgomery St., it is stated, has prepared plans for a 6-story apartment house which is to be erected by Geo. H. Fitch on Eddy and Leavenworth Sts.

Cripple Creek, Colo.—G. M. Young and W. T. Jewett, it is reported, will erect a residence at 1515 N. Cascade St., estimated to cost $37,000.

Atlanta, Ga.—The members of the Beth-Israel temple, it is stated, have secured a site at Washington and Clark Sts., and intend erecting in the near future a temple to cost about $35,000.

Augusta, Ga.—The congregation of the Green St. Presbyterian Church, it is reported, is contemplating the erection of a $15,000 edifice. Address Pastor.

Chicago, Ill.—Benj. F. George, builder, is having plans prepared and will take figures on an apartment building to be built at Indiana Ave and 60th St. It will cost $45,000.

Perley Hale, 132 Clark St., has prepared plans for an apartment building to be built at Ellis Park for Mrs. Johnson, 20 Hamilton Ave. It will be 3 story, 56x60 ft., and cost about $25,000.

Valentine Hofman contemplates the erection of a residence next spring at S. Homan and Warren Aves. It will be 3 story, 27x70 ft., have stone front, granite sides and cost $20,000.

Chrisman, Ill.—The Trus. of the M. E. Church, it is reported, have decided to erect an edifice to cost $15,000. Address Pastor.

Rantoul, Ill.—The members of the Methodist Church, it is reported, have decided to erect a $25,000 edifice. Rev. E. K. Towle, pastor.

Spencer, Ia.—The members of the M. E. Church, it is reported, have decided to erect a $25,000 edifice. Rev. C. D. Royse, Pastor.

Des Moines, Ia.—The members of the Zion Norwegian Lutheran Church (Rev. Wm. Williamson, pastor), it is stated, have secured a site at Des Moines and E. 9th Sts. and will erect a $15,000 edifice.

Baltimore, Md.—Chas. W. and John J. Hurst, it is stated, are contemplating the erection of a $40,000 apartment building at Cathedral and Chase Sts.

Hoboken, N. J.—Louis Meystere & Son, it is stated, have completed plans for a 5-story brick flat, which is to be erected at Jefferson and 5th Sts., by Michael Catello, at a cost of $30,000.

Toledo, O.—John F. McKenna, it is stated, is having plans prepared for a $60,000 flat which he proposes erecting at 21st and Monroe Sts.

Wellston, O.—Emile M. Ullrich, Schofield Bldg., Cleveland, is preparing plans for an edifice for St. Peter & St. Paul's R. C. Church, to cost about $60,000. Bids for construction will probably be called for in March.

Lancaster, Pa.—C. Emlen Urban, Trust Bldg., is preparing plans for an edifice for the Grace Lutheran Church, to cost about $50,000. Bids will probably be called for in February.

Palestine, Tex.—The congregation of the Howard M. E. Church, it is reported, is considering the erection of a $15,000 edifice. Rev. G. Garrison, Pastor.

Ft. Worth, Tex.—The members of the First Methodist Church, it is reported, are contemplating the erection of a $100,000 edifice.

Beaumont, Tex.—M. A. McKnight, of Beaumont, it is stated, has secured the contract to erect the Methodist Church at $38,000.

Bellingham, Wash.—The Salvation Army, it is reported, is contemplating the erection of a house of worship, to cost about $15,000.

Moose Jaw, Sask., N. W. Ter.—It is reported that the Trus. of the Methodist Church have decided to erect a $35,000 edifice.

New York, N. Y.

18th St. and 9th Ave., 6-story br. and stone tenemt.; c, $45,000; o, Jos. & Sigfried Wittner; a, Geo. F. Pelham.

95th St. and 2d Ave., 2 6-story br. and stone tenemts.; total c, $70,000; o, Ludins & Romm Realty Co.; a, Horenburger & Straub.

93d St. and West End Ave., 6-story br. and stone apartment house; c, $90,000; o, Bellwood Realty Co.; a, Geo. F. Pelham.

Bryant Ave. and Jennings St., 5-story br. tenemt.; c, $45,000; o, Louis V. La Velle; a, Wm. T. La Velle.

Cambrelling Ave. and 183d St., 5 4-story br. tenemts; total c, $50,000; o, John O'Leary; a, Robt. Glenn.

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* *Items marked thus give the names of parties awarded contracts.*

Prospect Ave. and Kelly St., 5-story br. tenemt.; c, $40,000; o, Prospect Ave. Realty Co.; a, Moore & Landsiedel.

Prospect Ave. and Fox St., 2 5-story br. tenemts.; total c, $64,000; o, Hercules Realty Co.; a, Nathan Langer.

133d St. and Amsterdam Ave., 6-story br. and stone tenemt.; c, $50,000; o, Arnold Realty Co.; a, B. W. Leviton.

8th Ave. and 153d St., 3 6-story br. and stone tenemts.; total c, $106,000; o, John Katzman; a, Rouse & Sloan.

136th St. and Brown Pl., 3 6-story br. tenemts.; total c, $125,000; o, Max Lipman; a, Horenburger & Straub.

152d St. and Courtlandt Ave., 6-story br. tenemt.; c, $45,000; o, Thos. D. Malcolm; a, M. J. Garvin.

156th St. and Elton Ave., 2 6-story br. tenemts.; total c, $80,000; o, The Bronxland Realty Co.; a, J. J. Vreeland.

SCHOOLS.

Notes Arranged Alphabetically by States.

Red Bluff, Cal.—The Bd. of High School Trus., it is stated, has adopted the plans of Stone & Smith, of San Francisco, for a brick and sandstone high school, which they propose erecting at an estimated cost of $27,000. It is reported that the contract for the construction of the building will be let Jan. 1.

Los Angeles, Cal.—It is reported that bids will be received until Jan. 5 by the Bd. Educ. (N. S. Averill, Secy.) for the steam boiler and generator for the Polytechnic High School.

La Junta, Colo.—The Directors of School Dist. No. 11, it is stated, are contemplating the erection of a 3-story high school, to cost $25,000.

Atlanta, Ga.—It is stated that plans are being prepared for a $50,000 building which is to be erected for the Atlanta School of Medicine, of which Dr. Geo. H. Noble is dean.

Belleville, Ill.—The congregation of the St. Luke's R. C. Church, it is reported, intends erecting an $18,000 parochial school.

Chicago, Ill.—The Bd. of Educ. has decided to co-operate with the city and county in establishing a school for truants and juvenile delinquents and has voted to expend approximately $100,000 for the purchase of a site and the erection of the building. D. H. Perkins, 17 Van Buren St., the board's architect, will prepare the plans.

Mooreshill, Ind.—The Trus. of Mooreshill College, it is stated, have decided to erect a new administration building to cost $50,000.

Greencastle, Ind.—The Trus. of DePauw Univ., it is stated, are preparing to erect a $50,000 Carnegie library.

South McAlester, Ind. Ter.—Bids will be received until Jan. 15 by the Bldg. Com. (Wm. Busby, Chmn.) for furnishing material and erecting the superstructure of a building for the Indian Consistory, to include plumbing, heating and wiring. Separate bids will also be considered. Probable cost, $100,000. Chas. I. Thompson, Archt., 111 Fulk Bldg., Little Rock, Ark.

Worthington, Ia.—The plans of Chandler & Park, of Racine, Wis., it is stated, have been accepted for a $35,000 school to be erected here.

Nadeau, Kan.—The dormitory at the Indian Government School here, it is reported, has been destroyed by fire.

Lawrence, Kan.—Willis K. Folks, Secy. and Purchasing Agent, University of Kansas, writes that John F. Stanton, of Topeka, is preparing plans for an auditorium and gymnasium, to cost about $100,000.

Donaldsonville, La.—It is stated that Mackenzie & Goldstein, of New Orleans, will have plans for the high school, which it is proposed erecting here, completed about Dec. 20. The building is to contain 14 rooms and an auditorium, is to be of brick and cement and cost about $50,000. D. B. Showalter is Secy. of Com. having the erection of the school in charge.

Cambridge, Mass.—The Trus. of Harvard Univ., it is stated, are contemplating the erection of a new law building twice the size of the present structure.

Boston, Mass.—N. Serracino, 1133 Broadway, New York, N. Y., is preparing plans for a school to be erected on N. Bennett St., Boston, for the Franciscan Fathers. The school will be fitted up with all modern sanitary arrangements.

**Grand Rapids, Mich.*—H. G. Grissman & Co., of South Bend, Ind., it is reported, have secured the contract to erect a school here at a cost of $148,740.

Duluth, Minn.—Chas. A. Bronson, Clk. Bd. Educ., writes that bids will be received as soon as plans are completed for two schools, each to cost $50,000, one to be erected at 6th St., of which German & Lignell, Terry Bldg., are the Archts., the other at West Duluth, of which A. Terryberry, Palladio Bldg., is Archt.

Laurel, Miss.—The following are reported to be the bids opened Dec. 7 by the City Council for erecting a high school: (*a*) building with tile roof (*b*) slate roof; (*c*) heating; (*d*) plumbing, and (*e*) electric wiring: C. H. Dabbs & Co., Meridian, Miss., *a* $20,991; Annis & Chambers, Laurel, *a* $19,856, and *b* $19,322; W. M. Norris, Laurel, *a* $20,000 and *b* $18,497; Sodeman Heat & Power Co., Memphis, Tenn., *c* $4,090; S. A. Carnes, Laurel, *c* $4,300, *d* $1,482 and *e* $100.

St. Louis, Mo.—The erection of a new building at Linwood College to cost about $75,000 is reported under consideration. Rev. Dr. G. F. Ayres, Pres. of the College.

Billings, Mont.—It is stated that the School Bd. will soon ask bids for erecting an 8-room school to cost about $30,000.

New York, N. Y.—It is stated that $3,000,000 was given at the meeting of the Bd. of Estimates on Dec. 8 to the Bldg. Com. of the Bd. of Educ. for the erection of buildings and the acquisition of sites.

*The following are the bids opened on Dec. 11 by C. B. J. Snyder, Supt. School Bldgs., for general construction, etc., of additions to and alterations in School 34, Bronx Boro.: Thos. Cockerill & Son, $138,900; Geo. Hildebrand, $133,600; Clarke & Stowe, $136,000; P. J. Brennan, $135,600; Thos. McKeown, $137,774; Wm. Werner, $142,689, and Patk. Sullivan, 389 Broome St., $129,600 (awarded contract).

*Bids were opened same time and place for sanitary work and gas fitting of School 42, Bronx Boro.: Frank J. Fee, 409 W. 32d St., $13,099 (awarded contract); Chris. Nally, $14,230; Wm. C. Ormond, $14,197; Jas. Fay's Son, $13,174; Jere. J. Deady, $14,100, and Rossman & Bracken Co., $15,700.

Bids will be received until Dec. 26 by C. B. J. Snyder, Supt. School Bldgs., New York City, for the general construction, etc., of School 27; general construction, etc., of additions to and alterations in Hall of the Bd. of Educ., both in Boro. Manhattan; also alterations of ventilating and heating apparatus in School 20, Flushing, Boro. Queens; bids will also be received same date for the sanitary work and gas fitting of new school No. 151, Boro. Brooklyn.

Plans have been filed for a 5-story school to be erected in 103rd St., near 2d Ave., as an annex to School No. 121, and is estimated to cost $80,000. C. B. J. Snyder, Archt., Park Ave. & 59th St.

Brooklyn, N. Y.—Plans have been filed for a 3-story and basement brick school, 160 x 78 ft., which is to be erected at Hicks and Poplar Sts., for the City of New York. Cost, $150,000. C. B. J. Snyder, Park Ave. & 59th St., N. Y. City, is the archt.

Binghamton, N. Y.—The Secy. of the Bd. of Educ., it is stated, has been authorized to receive bids until Dec. 26 for erecting the Robinson St. school.

Raleigh, N. C.—It is reported that the erection of a high school to cost about $150,000 is under consideration.

Lockland, O.—Bids will be received until Jan. 15 by Wilbur La Rue, Clk. Bd. Educ., for erecting a school. Bids on material and labor to be submitted separately.

Toledo, O.—It is stated that the Bd. of Educ. intends spending $200,000 in buildings this year, including the erection of an office building to cost $25,000, and an addition to the Ontario School to cost $20,000.

It is stated that bids will be received by the Bd. Educ., until Dec. 26, for erecting a 6-story addition to the Raymer School. Geo. L. McKesson, School Dir.

**Langston, Okla.*—Billings & Snyder, it is stated, have secured the contract to erect a dormitory at the Colored Agricultural & Normal Univ. at Langston, at $13,645.

Pittsburg, Pa.—Bids will be received until Dec. 29 at the office of Chas. J. Rieger, Archt., 314 4th Ave., for erecting a 3-story school for the Duquesne Sub Dist., at 1st Ave. and Ferry St. Robt. A. Foley, Secy. School Bd.

Bloomsburg, Pa.—It is reported that bids will soon be asked for erecting a building at the Normal School, to cost $45,000.

York, Pa.—David N. Crider, Secy. School Bd., writes that Chas. A. Keyworth, Small Bldg., is preparing plans for a school, to cost about $17,000.

Columbia, S. C.—The Trus. of Winthrop College, it is stated, are considering the erection of a building on the campus to cost $45,000.

Dallas, Tex.—Bids will probably be received about Feb. 1 for the erection of a building for Holy Trinity College, to cost $150,000. Architect, H. A. Overbeck, Slaughter Bldg. Rev. P. A. Finney, 130 Pavillion St., is reported interested.

Ft. Worth, Tex.—It is reported that it is proposed to erect a science hall at Polytechnic College, to cost about $25,000.

Rosalia, Wash.—It is stated that the citizens have voted in favor of issuing $12,000 school bonds. It is said to be the purpose of the School Trus. to erect a school to cost $15,000.

La Crosse, Wis.—It is reported that the Trus. of the La Crosse Normal School have decided to erect a $40,000 building.

Waukesha, Wis.—It is stated that plans have been prepared for a domitory to be erected at Carroll College, at a cost of $35,000. A. J. Frame, Chmn. Bldg. Com.

Delafield, Wis.—John A. Moller, of Milwaukee, it is stated, has prepared plans for the barracks and administration building, which is to be erected at St. John College to replace structures which were recently destroyed by fire. It is stated that the cost will be about $40,000. E. E. Smith, of Milwaukee, is Secy. of the College.

Sudbury, Ont.—Bids will be received until Dec. 20 by S. Fournier, Treas., for $23,500 school bonds.

Toronto, Ont.—It is stated that the Bd. of Educ. will erect a high school in Riverdale next spring.

Dundas, Ont.—It is stated that a by-law has been passed by the Town Council authorizing an election to be held to vote on the question of issuing $16,500 bonds for the erection of a high school.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Hot Springs, Ark.—The Hot Springs Sanitary & Fertilizer Co. proposes constructing a garbage disposal plant, at a cost of $2,000, and is now ready for bids. Address T. E. Rutherford, Secy. Burton Bldg.

Ft. Barrancas, Fla.—Bids will be received until Jan. 8 by Lieut. Col. Sam R. Jones, Ch. Q. M., U. S. A., for furnishing material and constructing at Ft. Barrancas, a garbage crematory building, and to furnish and install therein a garbage crematory.

Chicago, Ill.—All bids recently received for the collection and disposal of garbage of the entire city have been rejected, and J. M. Patterson, Comr. of Pub. Wks., will prepare new specifications and new bids will be called for.

Kansas City, Mo.—The Special Com. of Council on Garbage on Dec. 4 recommended to Council a resolution providing for an expenditure of $75,000 for the construction of a garbage plant adjoining the work house.

Erie, Pa.—See "Sewerage and Sewage Disposal."

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

The Monarch Coupler Co., Detroit, Mich., has begun the erection of a new casting plant, according to local newspaper reports.

The Metal Stamping Co., Jackson, Mich., is preparing plans for the construction of a new plant. Details not yet completed.

The Homan Mfg. Co., Cincinnati, O., has purchased site for a large concrete factory building, according to local newspaper reports.

The Viscoloid Co., Leominster, Mass., is contemplating additions to its present plant, though plans will probably not be completed before spring.

The West Side Mfg. Co., Milwaukee, Wis., is preparing to erect a 3-story brick factory building, to cost $30,000, according to local newspaper reports.

Walsh Brake Shoe & Foundry Co., Rock Island, Ill., will rebuild its recently burned plant, though site and size of plant have not yet been determined upon.

Tallant & Co., Christiansburg, Va., are building a new planing mill and are in the market for a planer, rip-raw, resaw, lathe, buzz planer; also a small electric motor.

The Champion Coated Paper Co., Hamilton, O., has begun the erection of a large pulp mill at Waynesville, N. C., to cost $1,500,000 and employ 1,000 persons, according to local reports.

The Pratt Construction Co., Decatur, Ill., is preparing to construct plants for the extraction of oils, fats and waxes under patents which it owns. The new plants will be constructed under contract.

Rand-McNally & Co., New York City, have purchased site at Ossining, N. Y., for a manufacturing plant, to cost $500,000 and afford employment for 1,500 persons, according to local newspaper reports.

U. S. Cooperage & Handle Co., Malden, Mo., is erecting a new plant, measuring 50 x 84 ft. This company is in the market for a 9 x 12 stationary engine, a 20-ton standard gauge locomotive and 10 logging cars.

The E. C. Hemmer Co., Savannah, Ga., mfrs. of naval stores, lumber and pine products, will erect additional pine products plants in the spring. This company has recently opened a branch office at Mannheim, Germany.

The works of the Pennington (N. J.) Foundry Co. have been purchased by a newly organized company known as the Union Boiler Co., of which Mr. Edward Benedict, Newark, N. J., is the head. New machinery will be required in the near future.

House Mfg. Co., Weldon, N. C., will build a new planing mill having a capacity of 30,000 ft. per day. By January, 1906, this company will be ready to purchase complete equipment, consisting of planers, molders, saws, engine, boiler, dry kilns, etc. Mr. T. M. House is general manager.

The New York State Steel Co., Buffalo, N. Y., has begun the construction of a plant, to consist of open hearth furnaces and blooming mill, having a capacity of 400 tons per day of billets, slabs and blooms. The plant will be provided with a steam power plant having a capacity of approximately 4,000 h.p.

Mr. Geo. M. Brill, Consulting Engineer, Chicago, Ill., is preparing plans for a new power plant for the Avery Mfg. Co., Peoria, Ill., to be ready for operation by Oct., 1906. The new plant will have a capacity of 1,000 h.p., divided between two direct connected engine-generator units, with necessary auxiliary apparatus.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

San Quentin, Cal.—See "Water."

Washington, D. C.—See "Miscellaneous."

Chicago, Ill.—See "Power Plants, Gas and Electricity."

Lebanon, Ind.—It is reported that bids will be received until Dec. 28 by Richd. I. Pennell, Co. Comr., for constructing 3 ditches.

Greenfield, Ind.—It is reported that bids are wanted by the County Auditor for dredging Brandywine Creek at a cost of $39,500.

New Orleans, La.—Bids will be received until Dec. 26 by Capt. J. F. McIndoe, Corps Engrs., U. S. A., for constructing about 261,000 cu. yds. of levee work in the Lafourche Levee Dist.

It is reported that bids will be received until Dec. 19 by the Bd. of State Engrs., at New Orleans, for constructing the following levees: Morganaza, Point Coupee parish, enlargement, approximately 140,000 cu. yds. Hickey levee, West Baton Rouge parish, enlargement approximately 70,000 cu. yds. Evergreen levee, Iberville parish, enlargement, approximately 72,000 cu. yds. Jack Strange levee, St. John parish, new levee, approximately 95,000 cu. yds.

Atlantic City, N. J.—E. D. Richtmire, Co. Engr., writes that all bids opened on Dec. 6 for installing gasoline engines to operate draw bridges have been rejected. New plans and specifications will be made and presented to the next meeting of the Bd. of Chosen Frreeholders on Jan. 3.

Brooklyn, N. Y.—Bids will be received until Dec. 20 by John T. Oakley, Comr. Water Supply, Gas and Electricity, New York City, for furnishing and delivering lumber (Virginia or North Carolina pine) f. o. b. cars at Seaford, Massapequa and Amityville, L. I., the quantities to include approximately 700,000 ft. B. M., 2x6 in. and up, by 12 ft.; 300,000 ft. B. M. 2x6-in. and up, by 16 ft.; 150,000 ft. B. M. 6x8-in. by 16 ft. and up; 150,000 ft. B. M. 4x8 in. and up, by 16 ft. and up.

Bids will be received until Dec. 21 by Nicholas J. Hayes, Fire Comr., New York City, for furnishing and delivering (40) fire alarm telegraph signal boxes for the Boros. of Brooklyn and Queens, also 50 for the Boro. Queens.

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* *Items marked thus give the names of parties awarded contracts.*

New York, N. Y.—All bids opened Dec. 5 by the Dept. of Docks and Ferries for preparing for and erecting on Whitehall St., East River, a new ferry house and structures have been rejected.

**Sylvan Beach, N. Y.*—Duncan W. Peck, of Syracuse, is reported to have secured the contract for furnishing the piling and cribbing timber for the Barge Canal dock at Sylvan Beach, for about $60,000.

Far Rockaway, L. I., N. Y.—Bids are wanted for filling of lands at this place, requiring about 200,000 cu. yds. sand to be pumped from ocean. Armstrong & Joyner, Archts., 1133 Bway., New York, N. Y.

Panama.—Bids will be received until Dec. 21 at the office of Alfred Anderson, Asst. Purchasing Agent, Panama R. R. Co., 24 State St., N. Y. City, for furnishing bar iron.

Wilkinsburg, Pa.—Jacob Weiman, of the Wilkinsburg Real Estate & Trust Co., is reported to be president of a company organized to establish an amusement park at Wood and Frankstown Aves.; it is reported that $225,000 will be expended.

Charleston, S. C.—Bids will be received until Jan. 6 by Mordecai T. Endicott, Ch. Bureau of Yards and Docks, Navy Dept., Washington, D. C., for constructing a steel caisson for dry dock No. 1, Navy Yard, Charleston; plans and specification may be seen at the navy yard named, or will be furnished by the Bureau upon deposit of $5.

Ft. Moultrie, S. C.—The following are reported to be the bids opened on Dec. 6 for the construction of an iron wharf at Sullivans Island, Ft. Moultrie: Simons-Mayrant Co., Charleston, $11,212 (4 mos.); Atlantic Dredging Co., Philadelphia, Pa., $11,017 (6 mos.); Grant Wilkins, Atlanta, Ga., $17,945 (6 mos.); J. Edw. Ogden, New York, N. Y., $15,938 (6 mos.); and Dean, Schwiers, Sutton & Co., New York, N. Y., $17,912 (4 mos.).

Ft. Worth, Tex.—It is stated that bids will be received until Jan. 4 by C. J. McKenna, Co. Aud., for an electric passenger elevator with dynamo, complete and in first-class running order, in Tarrant County Courthouse, Ft. Worth.

Norfolk, Va.—The Colonna Dry Dock Co. is reported to have been organized here with a capital of $200,000, for the erection of a steel shipbuilding and dry dock plant on the Colonna tract on the Eastern branch of the Elizabeth. H. A. Pressy and C. J. Howell, both of Washington, D. C., are reported interested.

C. S. Churchill, of Roanoke, Ch. Engr. Norfolk & Western Ry. Co., writes that plans are being prepared for a coal pier to be constructed at Norfolk.

Juarez, Mex.—The general government of Mexico is reported to have approved the plans of M. Mendiola, of Juarez, for the construction of permanent protective works along the Juarez banks of the Rio Grande.

Manila, P. I.—Plans and specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., for two steel wharves to be constructed in Manila harbor, bids for which will be received until Apr. 5 by Lieut. Col. W. L. Fisk, Corps Engrs., U. S. A., Director of Port Works, Philippine Islands.

PROPOSALS OPEN

For Proposals see pages 52, 56, and 58.

WATER.

Bids Close.		See Eng. Record.
Dec. 19.	Filtration plant, Troy, N. Y. Adv. Dec. 9, 16.	Dec. 9
Dec. 20.	Tunnel, Milwaukee, Wis.	Dec. 9
Dec. 20.	Water wks., Prescott, Wash.	Nov. 25
Dec. 20.	Pipe line, etc., San Diego, Cal.	Dec. 2
Dec. 20.	Water tower, Cleveland, O. Adv. Dec. 9.	Dec. 9
Dec. 21.	Mains, Muskogee, Ind. Ter. Adv. Dec. 2 to 9.	Dec. 2
Dec. 21.	C. i. pipe, Avalon, N. J.	Dec. 9
Dec. 21.	Engine, pumps, etc., Ft. Wayne, Ind. Adv. Dec. 9.	Dec. 9
Dec. 21.	Hydrants, etc., Chicago, Ill.	Dec. 16
Dec. 22.	Boilers, Chicago, Ill.	Dec. 9
Dec. 22.	Fire mains, New York, N. Y.	Dec. 16
Dec. 22.	Pipe, etc., San Quentin, Cal.	Dec. 16
Dec. 22.	Reservoir, etc., Montgomery, Ala.	Dec. 16
Dec. 22.	Pipe, etc., Philadelphia, Pa.	Dec. 16
Dec. 26.	Pipe, etc., Washington, D. C.	Dec. 9
Dec. 27.	C. I. pipe, Brooklyn, N. Y.	Dec. 16
Dec. 27.	Well, Perth Amboy, N. J. Adv. Dec. 16.	Dec. 16
Dec. 27.	Hydrants, New York, N. Y.	Dec. 16
Dec. 29.	Boilers, Chicago, Ill.	Dec. 16
Dec. 29.	**Canal, etc., Klamath Falls, Ore.** Adv. Nov. 4 to Dec. 16.	**Nov. 4**
Dec. 30.	Pumping engine, Washington, D. C. Adv. Dec. 2 to Dec. 9.	Dec. 2
Dec. 30.	Tunnel, Chicago, Ill.	Dec. 16
Jan. 1.	Irrig. work, El Campo, Tex.	Oct. 7
Jan. 1.	Irrig. system, Encampment, Wyo.	Dec. 9
Jan. 2.	**Water wks., Manila, P. I.**	**Sep. 30**
Jan. 2.	Water wks, Shenandoah, Va.	Dec. 2
Jan. 2.	Well, Rochelle, Ill. Adv. Dec. 16.	Dec. 16
Jan. 2.	Water wks., Piedmont, W. Va.	Dec. 16
Jan. 9.	Filter plant, power, etc., Macon, Miss. Adv. Dec. 16.	Dec. 16
Jan. 10.	Water wks., Osceola, Ark. Adv. Dec. 16.	Dec. 16
Jan. 11.	Main, Ft. Lincoln, N. D.	Dec. 16
Jan. 15.	Irrig. canals, Huntley, Mont. Adv. Dec. 9, 16.	Dec. 9
Jan. 15.	**Pumping engine, Lincoln, Neb.** Adv. Dec. 9 to 16.	**Dec. 9**
Jan. 15.	Water wks., Chihuahua, Mex.	Dec. 16
Feb. 1.	Water wks., Woodward, Okla. Ter.	Nov. 25
———	Pump, etc., Valdosta, Ga.	Dec. 2
———	Meters, Delphi, Ind.	Dec. 9

SEWERAGE AND SEWAGE DISPOSAL.

Dec. 19.	Independence, Kan. Adv. Nov. 18.	Nov. 18
Dec. 19.	Trenton, N. J.	Dec. 16
Dec. 20.	Bristol, Pa. Adv. Nov. 18 to Dec. 16.	Nov. 18
Dec. 20.	South Bend, Ind. Adv. Dec. 9, 16.	Dec. 9
Dec. 20.	Midland, Ont.	Dec. 16
Dec. 21.	Muskogee, Ind. Ter. Adv. Dec. 2 to 9.	Dec. 2
Dec. 21.	Cleveland, O.	Dec. 16
Dec. 21.	Fredericton, N. B. Adv. Dec. 16.	Dec. 16
Dec. 21.	St. Paul, Minn.	Dec. 16
Dec. 21.	Kirkwood, Mo. Adv. Dec. 16.	Dec. 16
Dec. 22.	Cincinnati, O.	Dec. 2
Dec. 23.	Napoleon, O.	Dec. 16
Dec. 26.	Philadelphia, Pa.	Dec. 16
Dec. 26.	Long Island City, L. I., N.Y.	Dec. 16
Dec. 27.	Cincinnati, O.	Dec. 9
Dec. 26.	Cincinnati, O.	Dec. 16
Dec. 30.	Waterbury, Conn.	Dec. 9
Dec. 30.	Ft. Assinniboine, Mont.	Dec. 9
Dec. —.	Rockport, Ind.	Nov. 11
Jan. 12.	Manila, P. I.	Sep. 30
Jan. 15.	Washington, D. C. Adv. Dec. 16.	Dec. 16
Feb. 1.	Woodlawn, Ala.	Oct. 28
Feb. 1.	Libertyville, Ill.	Nov. 25
Feb. 1.	St. Johns, Ore.	Dec. 16
Jan. 4.	Washington, Ia.	Dec. 16
Jan. 9.	Cincinnati, O.	Dec. 16
Feb. 15.	Princeton, Ind.	Nov. 25
Jan. 15.	Chihuahua, Mex.	Dec. 16
Feb. 18.	Ravenna, O.	Dec. 16
Feb. —.	Lake Forest, Ill.	Nov. 25
Feb. —.	Highland Park, Ill.	Nov. 25

BRIDGES.

Dec. 19.	Cambridge, O.	Dec. 9
Dec. 19.	Ogallala, Neb.	Dec. 16
Dec. 20.	Knoxville, Tenn.	Dec. 9
Dec. 21.	Paxton, Ill.	Dec. 16
Dec. 21.	Woodbury, N. J.	Dec. 16
Dec. 22.	Carlisle, Pa.	Dec. 9
Dec. 23.	La Crosse, Wis.	Dec. 16
Dec. 23.	Larrabee, Wis.	Dec. 16
Dec. 27.	Norristown, Pa.	Dec. 2
Dec. 28.	Richmond, Ind.	Dec. 16
Dec. 28.	Redfield, S. D.	Dec. 16
Dec. 29.	Kilbourn, Wis.	Dec. 16
Jan. 1.	Pensacola, Fla.	Sep. 30
Jan. 2.	Helena, Mont.	Dec. 9
Jan. 2.	Zim, Minn.	Dec. 9
Jan. 3.	Cheyenne, Okla.	Dec. 16
Jan. 4.	Salem, Mass.	Dec. 9
Jan. 4.	Gloucester, Mass.	Dec. 9
Jan. 5.	Vermillion, S. D.	Dec. 16
Jan. 6.	Manitowoc, Wis.	Dec. 16
Jan. 9.	Chattanooga, Tenn. Adv. Dec. 9, 16.	Dec. 9
Jan. 9.	Brookings, S. D.	Dec. 16
Apr. 1.	West Fork, W. Va.	Dec. 2

PAVING AND ROADMAKING.

Dec. 18.	Syracuse, N. Y.	Dec. 16
Dec. 19.	Cincinnati, O.	Dec. 2
Dec. 21.	Buffalo, N. Y.	Dec. 9
Dec. 21.	Avalon, N. J.	Dec. 9
Dec. 22.	St. Louis, Mo.	Dec. 16
Dec. 22.	Philadelphia, Pa.	Dec. 16
Dec. 27.	Montgomery, Ala.	Dec. 9
Dec. 27.	Rochester, Ind.	Dec. 16
Dec. 27.	Brooklyn, N. Y.	Dec. 16
Dec. 28.	Little Rock, Ark.	Dec. 9
Dec. 28.	Wichita, Kan.	Dec. 16
Dec. 28.	Buffalo, N. Y.	Dec. 16
Jan. 2.	Helena, Mont.	Dec. 9
Jan. 2.	Brookville, Ind.	Dec. 16
Jan. —.	Spencer, Ind.	Dec. 16
———	Lynchburg, Va. Adv. Dec. 16.	Dec. 16

POWER PLANTS, GAS AND ELECTRICITY.

Dec. 19.	Washington, D. C.	Dec. 9
Dec. 20.	Chicago, Ill.	Dec. 16
Dec. 22.	Philadelphia, Pa.	Dec. 16
Dec. 26.	Washington, D. C.	Dec. 2
Dec. 26.	Washington, D. C.	Dec. 16
Dec. 27.	Lockport, Ill.	Nov. 4
Dec. 28.	Rio Vista, Cal.	Dec. 9
Dec. 30.	Vancouver Barracks, Wash.	Dec. 16
Dec. 30.	Rome, N. Y. Adv. Dec. 16.	Dec. 16
Jan. 2.	Shenandoah, Va.	Dec. 2
Jan. 2.	Tallapoosa, Ga.	Dec. 16
Jan. 5.	Washington, D. C. Adv. Dec. 2 to 16.	Dec. 2
Jan. 4.	Jacksonville, Fla.	Dec. 16
Jan. 4.	Elbow Lake, Minn.	Dec. 16
Jan. 9.	Washington, D. C.	Dec. 16
Jan. 9.	Anaheim, Cal.	Dec. 16
Jan. 15.	Cincinnati, O.	Dec. 2
Jan. 16.	Newark, N. J.	Dec. 16
———	Bamberg, S. C.	Dec. 2
Apr. 1.	Eugenia, Ont.	Dec. 16
Apr. —.	Oakesdale, Wash.	Nov. 25

BUILDINGS.

Dec. 18.	School, New York, N. Y.	Dec. 9
Dec. 18.	School, Flushing, L. I., N. Y.	Dec. 9
Dec. 18.	**Court house plans, Woodsfield, O.**	**Dec. 9**
Dec. 20.	Pub. bldg., Annapolis, Md.	Nov. 18
Dec. 20.	School, Sanford, N. C.	Nov. 25
Dec. 20.	**Pub. bldg., Washington, D. C.** Adv. Dec. 2 to 9.	**Dec. 2**
Dec. 20.	School, Paris, Tex.	Dec. 9
Dec. 20.	Pub. bldg., Kansas City, Mo.	Dec. 9
Dec. 20.	Bath, Brooklyn, N. Y.	Dec. 9
Dec. 20.	Pub. bldg., Baltimore, Md.	Dec. 16
Dec. 21.	Htg. Univ., Wilberforce, O.	Nov. 25
Dec. 21.	Arsenal, Philadelphia, Pa. Adv. Dec. 9, 16.	Dec. 9
Dec. 21.	Pub. bldg., New York, N. Y.	Dec. 16
Dec. 22.	Hospital, Prescott, Ariz. Adv. Nov. 25 to Dec. 16.	Nov. 25
Dec. 22.	School improv., Toledo, O.	Dec. 2
Dec. 22.	Jail, Sparta, Tenn.	Dec. 9
Dec. 22.	Courthouse, Ashland, Ala.	Dec. 16
Dec. 22.	Remov. bus. bldg., Chattanooga, Tenn.	Dec. 16
Dec. 22.	Bus. bldgs., Fond du Lac, Wis.	Dec. 16
Dec. 26.	Hospital, Ft. Wood, N. Y. Harbor	Dec. 9
Dec. 26.	School, Toledo, O.	Dec. 16
Dec. 26.	Jail, Jacksonville, Fla.	Dec. 16
Dec. 26.	School, Binghamton, N. Y.	Dec. 16
Dec. 26.	Post bldg., Ft. Slocum, N. Y.	Dec. 16
Dec. 26.	Schools, New York, N. Y.	Dec. 16
Dec. 28.	Courthouse plans, Griffin, Ga.	Dec. 9
Dec. 28.	Htg. P. O., Battle Creek, Mich. Adv. Dec. 9 to 16.	Dec. 9
Dec. 29.	School. Marquette, Mich.	Nov. 18
Dec. 29.	School, Pittsburg, Pa.	Dec. 16
Dec. 30.	Pub. bldgs., Ft. Assinniboine, Mont.	Dec. 9
Dec. 30.	Post bldgs., Angel Island, Cal.	Dec. 16
Dec. —	School, Bloomington, Ind.	Oct. 21
Jan. 1.	**Hotel, Davenport, Ia.**	**Sep. 30**
Jan. 1.	Jail, etc., Lillington, N. C.	Nov. 25
Jan. 1.	Repairing court house, etc., Kentland, Ind.	Dec. 9
Jan. 1.	School, Red Bluff, Cal.	Dec. 16
Jan. 1.	Bus. bldg., Goldsboro, N. C.	Dec. 16
Jan. 2.	School, Riverside, Cal.	Dec. 2
Jan. 2.	Pub. bldg., Akron, O.	Dec. 9
Jan. 4.	Post Office, Natchitoches, La.	Nov. 18
Jan. 4.	Library for Univ., Bloomington, Ind. Adv. Nov. 25.	Nov. 25
Jan. 4.	School, Pawhuska, Okla. Ter.	Dec. 2
Jan. 5.	Htg. pub. bldg., Washington, D. C. Adv. Dec. 2 to 16.	Dec. 2
Jan. 5.	School, Los Angeles, Cal.	Dec. 16
Jan. 5.	Htg. post office, Laramie, Wyo.	Dec. 16
Jan. 8.	Court house, Hillsboro, N. D.	Nov. 25
Jan. 8.	Improv. at War College, Washington, D. C. Adv. Dec. 9, 16.	Dec. 9
Jan. 9.	Hospital, Cincinnati, O.	Dec. 16
Jan. 10.	Library plans, Toronto, Ont.	Sep. 23
Jan. 10.	P. O. bldg., Reno, Nev. Adv. Nov. 18 to 25.	Nov. 18
Jan. 11.	Post bldg., Ft. Du Pont, Del. Adv. Dec. 16.	Dec. 16
Jan. 15.	School plans, Newark, N. J.	Dec. 9
Jan. 15.	School plans, Dallas, Tex.	Dec. 9
Jan. 15.	School, South McAlester, Ind. Ter.	Dec. 16
Jan. 15.	School, Lockland, O.	Dec. 16
Jan. 20.	Pub. bldg., Bremerton, Wash.	Dec. 16
Jan. 31.	Remov. courthouse, etc., Newark, N. J. Adv. Dec. 16.	Dec. 16
Jan. —	**Hotel annex, Louisville, Ky.**	**Nov. 4**
Jan. —.	Htg. college, Medford, Mass.	Dec. 2
Feb. 1.	Plans for armory, Hartford, Conn.	Nov. 18
Feb. 1.	College, Dallas, Tex.	Dec. 16
Feb. —.	Hospital, Indianapolis, Ind.	Nov. 25
Feb. —.	Church, Lancaster, Pa.	Dec. 16
Mar. —.	Church, Wellston, O.	Dec. 16
———	School, Chemawa, Ore.	Nov. 25

MISCELLANEOUS.

Dec. 18.	**Wickets for dams, Pittsburg, Pa.** Adv. Nov. 25 to Dec. 16.	**Nov. 25**
Dec. 18.	Metal work, Philadelphia, Pa. Adv. Nov. 25 to Dec. 2.	Nov. 25
Dec. 19.	Timber, New Orleans, La.	Dec. 9
Dec. 19.	Supplies, Washington, D. C.	Dec. 9
Dec. 19.	Supplies, San Francisco, Cal.	Nov. 18
Dec. 19.	Broken stone, New Brighton, S. I, N. Y.	Dec. 9
Dec. 19.	Levee work, New Orleans, La.	Dec. 16
Dec. 20.	Lumber, Brooklyn, N. Y.	Dec. 16
Dec. 20.	Supplies, Chicago, Ill.	Dec. 16
Dec. 21.	Fire alarm boxes, Brooklyn, N. Y.	Dec. 16
Dec. 21.	Bar iron, Panama	Dec. 16
Dec. 22.	Dredging, Richmond, Va. Adv. Dec. 2 to 16.	Nov. 25
Dec. 22.	Supplies, San Quentin, Cal.	Dec. 16
Dec. 26.	Supplies, Washington, D. C.	Dec. 2
Dec. 26.	Supplies, Washington, D. C.	Dec. 9
Dec. 26.	Pine, etc., Guantanamo, Cuba	Dec. 9
Dec. 26.	Supplies, Washington, D. C.	Dec. 16
Dec. 26.	Levee, New Orleans, La.	Dec. 16
Dec. 26.	R. R. ties, Richmond, Va.	Dec. 16
Dec. 27.	Excav., Brooklyn, N. Y.	Dec. 16
Dec. 28.	R. R. work, Cincinnati, O.	Dec. 16
Dec. 28.	Ditches, Lebanon, Ind.	Dec. 16
Dec. 29.	Wharf, Ft. Monroe, Va. Adv. Dec. 9.	Dec. 9
Jan. 1.	Statue plans, Indianapolis, Ind.	Jul. 22
Jan. 1.	R. R. work, Dubuque, Ia.	Nov. 11
Jan. 2.	R. R. work, Santiago, Chili	Nov. 25
Jan. 3.	El. Ry., San Francisco, Cal.	Dec. 16
Jan. 4.	Garbage plant, Lexington, Ky. Adv. Dec. 9 to 16.	Dec. 9
Jan. 4.	Elevator, Ft. Worth, Tex.	Dec. 16
Jan. 5.	Elevators, Washington, D. C. Adv. Dec. 9, 16.	Dec. 9
Jan. 6.	Caisson, Charleston, S. C.	Dec. 16
Jan. 8.	Dredging, Jacksonville, Fla. Adv. Dec. 9, 16.	Dec. 9
Jan. 8.	Garb. crematory, Ft. Barrancas, Fla.	Dec. 16
Jan. 9.	Wharf, etc., Auckland, N. Z. Adv. Oct. 14 to Dec. 9.	Oct. 14
Jan. 9.	**Jetty work, etc., Auckland, N. Z.** Adv. Nov. 4 to Dec. 9.	**Nov. 4**
Jan. 9.	Supplies, Washington, D. C.	Dec. 16
Jan. 12.	Ditch, Glencoe, Minn.	Dec. 9
Jan. 15.	Excav. work, Buffalo, N. Y. Adv. Dec. 2, 16.	Dec. 2
Apr. 2.	'06. Harbor Work, Valparaiso, Chili. **Adv. Apr. 29 to Sep. 9.**	Apr. 29
Apr. 5.	Steel wharves, Manila, P. I.	Dec. 16
———	Grading, Beaumont, Tex.	Dec. 2
———	Filling in land, Far Rockaway, L. I., N. Y.	Dec. 16
———	R. R. work, Roanoke, Va. Adv. Dec. 16.	Dec. 16

**Items marked thus give the names of parties awarded contracts.*